

2026

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Grade four

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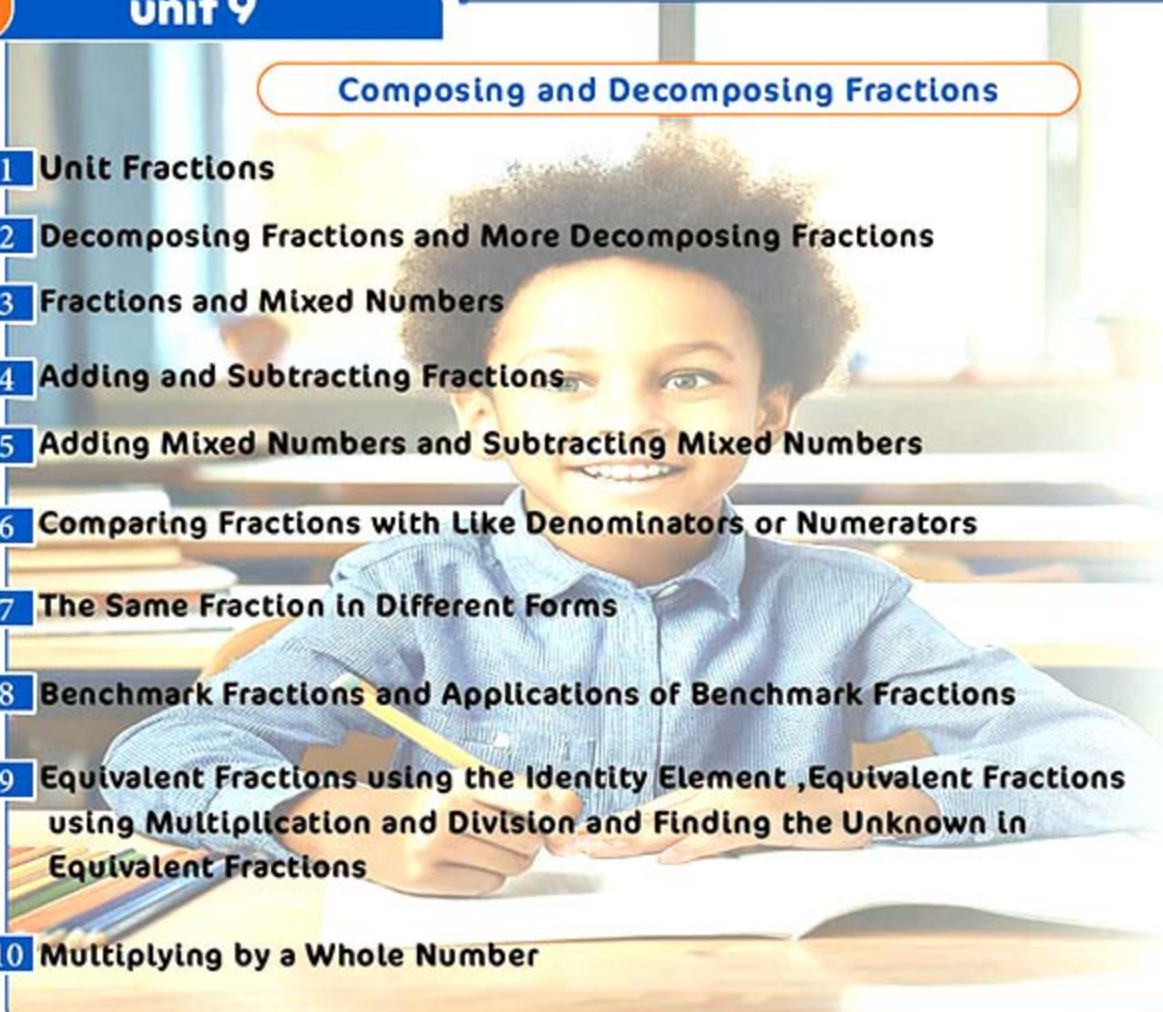
Second Term

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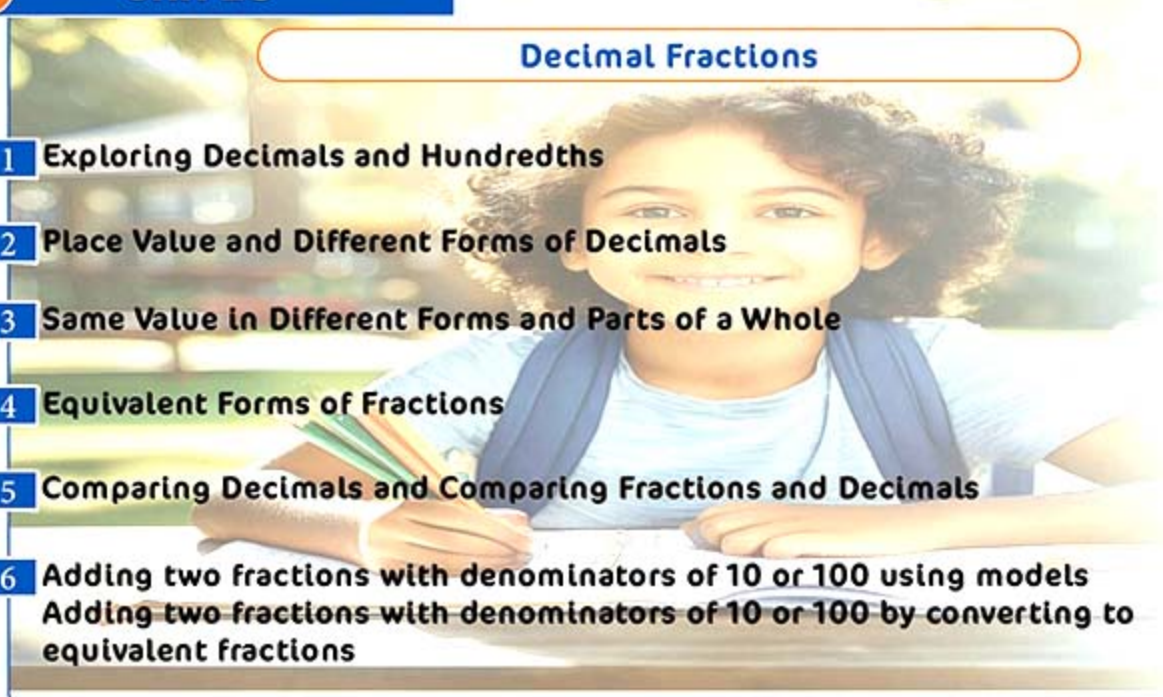
Composing and Decomposing Fractions

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Unit 9

Composing and Decomposing Fractions



1

Unit Fractions

2

- ✓ Decomposing Fractions
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5

- ✓ Adding Mixed Numbers
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8

- ✓ Benchmark Fractions
- ✓ Applications of Benchmark Fractions

9

- ✓ Equivalent Fractions using the Identity Element
- ✓ Equivalent Fractions using Multiplication and Division
- ✓ Finding the Unknown in Equivalent Fractions

10

Multiplying by a Whole Number

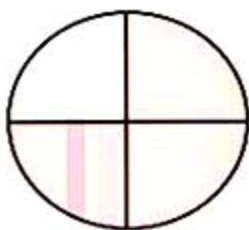
Lessons

Unit Fractions

Learn 1 Unit Fractions

Common fractions: They are fractions written in the form of a numerator and a denominator.

For example



$\frac{3}{4}$ → numerator
 $\frac{3}{4}$ → denominator

read as three quarters.

Unit Fractions:

A unit fraction is a fraction that has 1 as its numerator

For example



$\frac{1}{3}$ → numerator
 $\frac{1}{3}$ → denominator

read as one third

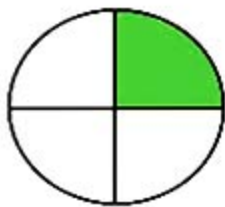
The numerator is the number written above the fraction bar. It represents the number of shaded parts in the shape.

The denominator is the number written below the fraction bar. It represents the total number of equal parts in the shape

Example 4

Write and read the fraction that represents the shaded parts in each of the following models:

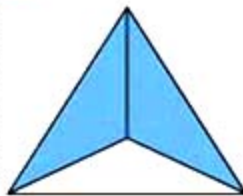
1



2



3



4



Solution

1 $\frac{1}{4}$

one quarter

2 $\frac{3}{5}$

three fifths

3 $\frac{2}{3}$

two thirds

4 $\frac{5}{8}$

five eighths

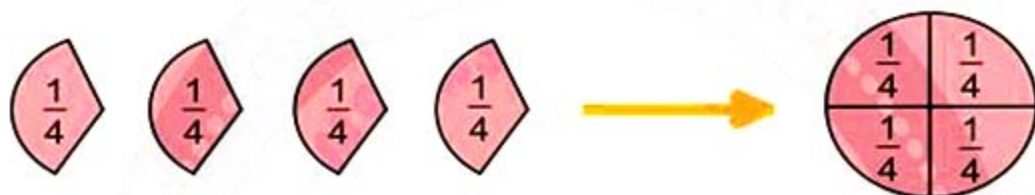
Learn



2 Compose proper fractions

Compose proper fractions : means putting together unit fractions to make a new fraction or a whole number.

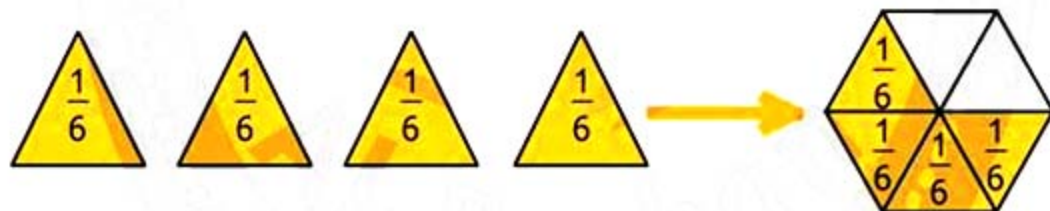
➤ We can use unit fractions to make one whole, as shown below:



$$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{4}{4} = 1$$

The number of unit fractions that make the whole = $\frac{4}{4} = 1$

➤ We can also use unit fractions to make another fraction, as follows:



$$\frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} = \frac{4}{6}$$

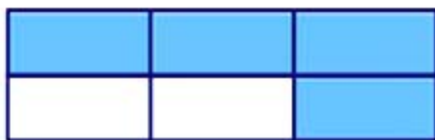
The number of unit fractions that make the whole = $\frac{4}{6} = \frac{2}{3}$

Example 2



Write an equation using unit fractions to show how to form the fraction that represents the shaded part. Then, state how many unit fractions are used to make that fraction.

1



2





3



4

**Solution**

1 $\frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} = \frac{4}{6}$, The number of unit fractions that make $\frac{4}{6} = 4$

2 $\frac{1}{8} + \frac{1}{8} + \frac{1}{8} = \frac{3}{8}$, The number of unit fractions that make $\frac{3}{8} = 3$

3 $\frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} = \frac{5}{5}$, The number of unit fractions that make $\frac{5}{5} = 5$

4 $\frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} = \frac{6}{8}$, The number of unit fractions that make $\frac{6}{8} = 6$

Try by yourself

Complete the following table:

Model	proper fraction	unit fraction	Equation for proper fraction
1			
2	$\frac{5}{7}$		

Exercises on Unit Fractions



1 Choose the correct answer from the given options :

1 Which of the following represents a unit fraction?

(A) $\frac{2}{3}$

(B) $\frac{1}{3}$

(C) $\frac{3}{5}$

(D) $\frac{5}{1}$

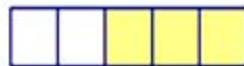
2 The proper fraction that represents the shaded part in the given model is:.....

(A) $\frac{2}{5}$

(B) $\frac{3}{5}$

(C) $\frac{1}{5}$

(D) $\frac{5}{3}$



3 One whole equals how many halves?

(A) 2

(B) 1

(C) 4

(D) 3

4 The number of unit fractions that make the fraction $\frac{5}{8}$ is

(A) 5

(B) 8

(C) 3

(D) 1

5 $\frac{1}{7} + \frac{1}{7} + \frac{1}{7} = \dots\dots\dots$

(A) $\frac{3}{21}$

(B) $\frac{3}{7}$

(C) $\frac{5}{7}$

(D) $\frac{1}{49}$

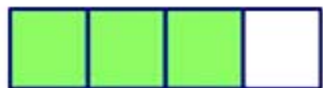
2 Write an equation representing the ordinary fraction that shows the shaded part using unit fractions

Example



$$\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$$

1



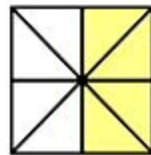
.....

2



.....

3



.....



4



.....

5



.....

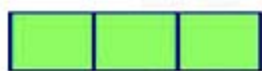
3 write the proper fraction that represents the shaded part using unit fractions, as shown in the example:

Example



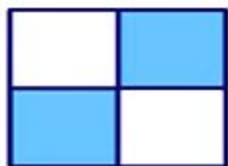
$$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{3}{4}$$

1



.....

2



.....

3



.....

4

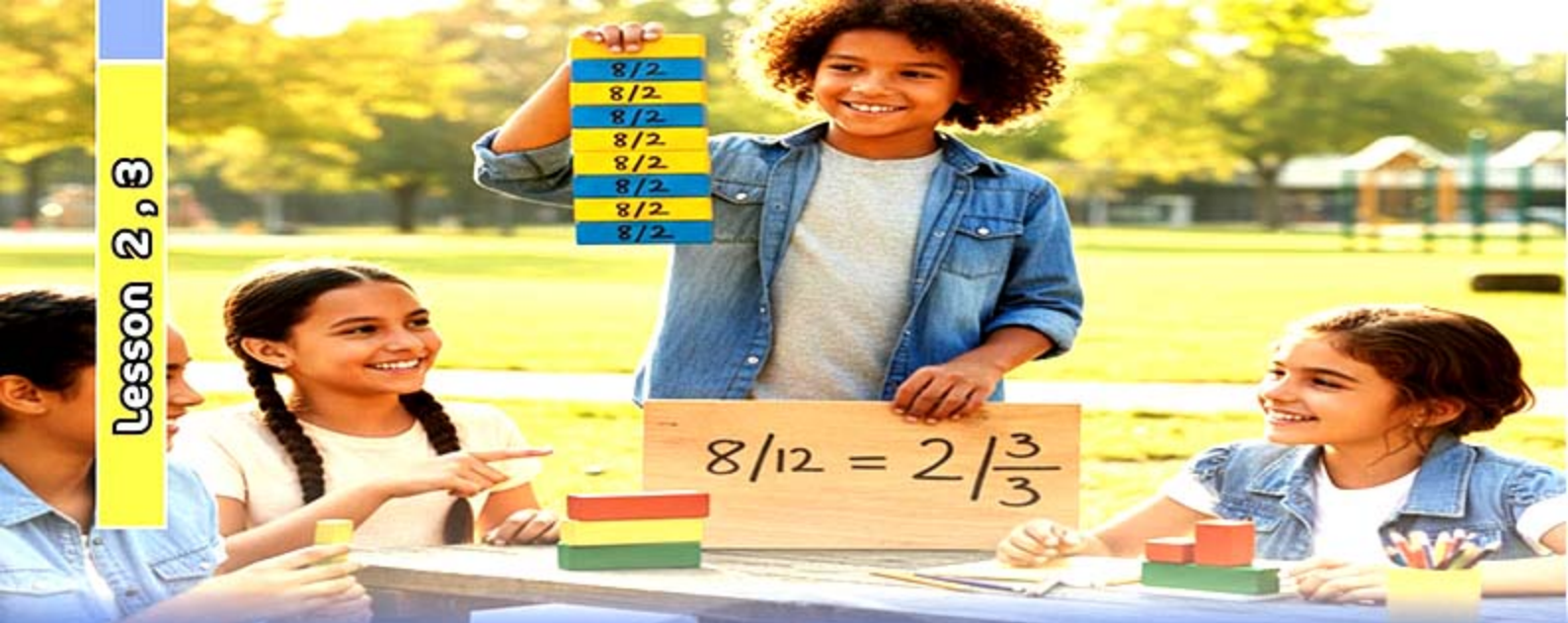


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5



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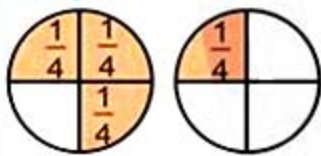
Decomposing Fractions and More Decomposing Fractions

Learn 1 Decomposing a fraction

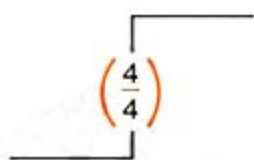
Decomposing a fraction means breaking down a proper fraction or one whole into smaller parts.

► We can use unit fractions or proper fractions to decompose a fraction or one whole.

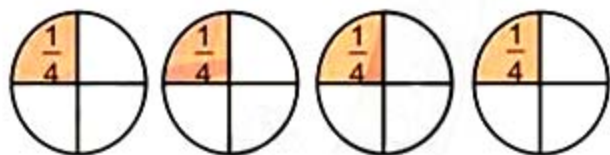
Using Unit Fractions



$$\frac{3}{4} + \frac{1}{4} = \frac{4}{4}$$



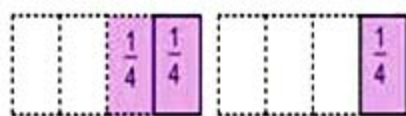
Using Unit Fractions:



$$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{4}{4}$$

► We can use unit fractions or proper fractions to decompose a fraction

Using Unit Fractions



$$\frac{2}{4} + \frac{1}{4} = \frac{3}{4}$$



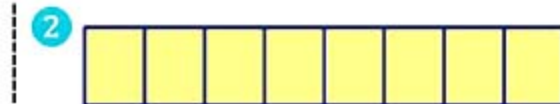
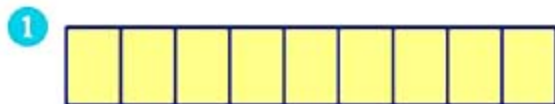
Using Unit Fractions



$$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{3}{4}$$

**Example 1**

Write an equation to decompose one whole into unit fractions, as shown in the models

**Solution**

1

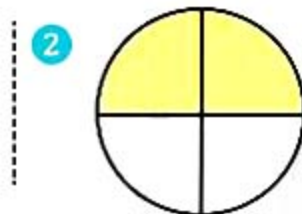
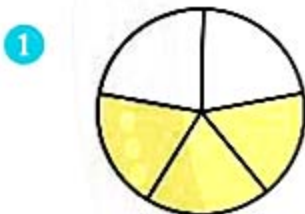
$$\frac{1}{9} + \frac{1}{9} + \frac{1}{9} + \frac{1}{9} + \frac{1}{9} + \frac{1}{9} + \frac{1}{9} + \frac{1}{9} + \frac{1}{9} = \frac{9}{9} = 1$$

2

$$\frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} = \frac{8}{8} = 1$$

Example 2

Write an equation to decompose the given proper fractions into unit fractions.

**Solution**

1

$$\frac{1}{5} + \frac{1}{5} + \frac{1}{5} = \frac{3}{5}$$

2

$$\frac{1}{4} + \frac{1}{4} = \frac{2}{4}$$

Example 3

On the number line, locate point **E** that represents $\frac{1}{5}$.

**Solution**

$\frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} = \frac{4}{5}$ Therefore, the number of unit fractions that make the fraction $\frac{4}{5} = 4$

Example 4

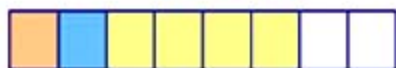


Decompose the proper fraction $\frac{6}{8}$ in three different ways using models

Solution



first way



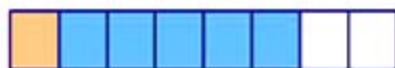
$$\frac{1}{8} + \frac{2}{8} + \frac{3}{8} = \frac{6}{8}$$

second way



$$\frac{2}{8} + \frac{2}{8} + \frac{2}{8} = \frac{6}{8}$$

third way



$$\frac{1}{8} + \frac{5}{8} = \frac{6}{8}$$

Example 5

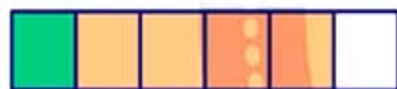


Decompose the proper fraction $\frac{5}{6}$ in different ways.

Solution



We can divide the numerator in different ways while keeping the denominator the same.



$$\frac{5}{6} = \frac{1}{6} + \frac{4}{6}$$



$$\frac{5}{6} = \frac{3}{6} + \frac{2}{6}$$



$$\frac{5}{6} = \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6}$$



$$\frac{5}{6} = \frac{1}{6} + \frac{2}{6} + \frac{2}{6}$$

There are many other ways to decompose the same fraction.

**Example 6**

Decompose the proper fraction $\frac{7}{9}$ in two different ways.

Solution

First way

$$\frac{2}{9} + \frac{5}{9} = \frac{7}{9}$$

Second way

$$\frac{3}{9} + \frac{4}{9} = \frac{7}{9}$$

Try by yourself

Decompose fractions :

1

$$\frac{3}{8} = \dots + \dots + \dots$$

2

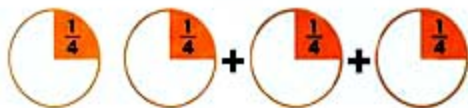
$$\frac{5}{6} = \dots + \dots$$

3

$$\frac{3}{3} = \dots + \dots + \dots$$

**Decomposing Fractions: A Visual Guide****What is Decomposing?**

It's the process of splitting a fraction into a sum of smaller fractions that have the same denominator.

**Method 1: Use Unit Fractions**

$$\frac{3}{4} = \frac{1}{4} + \frac{1}{4} + \frac{1}{4}$$

The simplest way is to add up the unit fractions. For example, $\frac{3}{4}$ can be written as $\frac{1}{4} + \frac{1}{4} + \frac{1}{4}$.

Method 1: Use Unit Fractions

$$\frac{3}{4} = \frac{1}{4} + \frac{1}{4} + \frac{1}{4}$$

The simplest way is to add up the unit fractions. For example, $\frac{3}{4}$ can be written as $\frac{1}{4} + \frac{1}{4} + \frac{1}{4}$.

Method 2: Use Any Combination

$$\frac{5}{6} = \frac{1}{6} + \frac{4}{6} = \frac{3}{6} + \frac{2}{6}$$

The same fraction can be decomposed in many different ways. For example, $\frac{5}{6}$ can be $\frac{1}{6} + \frac{4}{6}$ or $\frac{3}{6} + \frac{2}{6}$.

Exercises on

Decomposing Fractions and More

Decomposing Fractions



1 Choose the correct answer from the given options :

1 Which of the following represents a unit fraction?

(A) $\frac{2}{3}$

(B) $\frac{8}{5}$

(C) $1\frac{1}{4}$

(D) $\frac{1}{10}$

2 The numerator of the proper fraction $\frac{5}{8}$ is

(A) 13

(B) 6

(C) $\frac{1}{8}$

(D) 5

3 $\frac{1}{5} + \frac{1}{5} + \frac{1}{5} = \dots\dots\dots$

(A) $\frac{3}{5}$

(B) $\frac{3}{15}$

(C) $\frac{1}{15}$

(D) $\frac{5}{3}$

4 $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \dots\dots\dots$

(A) $\frac{3}{4}$

(B) $\frac{1}{4}$

(C) $\frac{4}{5}$

(D) $\frac{3}{12}$

5 Which of the following mathematical expressions has the same value as the fraction $\frac{4}{5}$?

(A) $\frac{4}{5} + \frac{4}{5} + \frac{4}{5} + \frac{4}{5}$

(B) $\frac{2}{5} + \frac{1}{5} + \frac{1}{5}$

(C) $\frac{1}{4} + \frac{1}{4} + \frac{3}{4}$

(D) $\frac{1}{5} + \frac{1}{5} + \frac{1}{5}$

6 The number of unit fractions that make up the proper fraction $\frac{2}{3}$

(A) 1

(B) 2

(C) 3

(D) 5

7 $1 = \frac{1}{7} + \frac{2}{7} + \dots\dots\dots$

(A) $\frac{1}{7}$

(B) $\frac{2}{7}$

(C) $\frac{3}{7}$

(D) $\frac{4}{7}$

2 Complete the following:

1 $\frac{1}{8} + \frac{1}{8} + \frac{1}{8} = \dots\dots\dots$

2 $\frac{4}{5} = \frac{2}{5} + \dots\dots\dots$

3 $\frac{5}{10} = \frac{2}{10} + \frac{1}{10} + \dots\dots\dots$

4 $\frac{1}{6} + \dots\dots\dots$

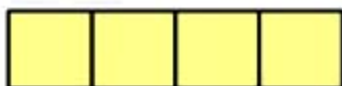
5 The proper fraction with denominator 4 and numerator 3 is



- 6 The number of fifths in one whole = fifth
- 7 The proper fraction with denominator 8 and numerator 3 is
- 8 The number of unit fractions that make five sevenths is
- 9 The number of quarters in one whole is
- 10 $\frac{1}{3} + \frac{1}{3} = \dots\dots\dots$
- 11 $\frac{1}{5} + \frac{1}{5} + \frac{1}{5} = \dots\dots\dots$
- 12 $\dots\dots\dots + \frac{1}{6} = \frac{5}{6}$
- 13 $\frac{1}{9} + \dots\dots\dots + \frac{3}{9} = \frac{7}{9}$
- 14 $\dots\dots\dots = \frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{1}{7}$
- 15 $\frac{\dots\dots\dots}{4} + \frac{\dots\dots\dots}{4} + \frac{\dots\dots\dots}{4} = \text{Three Fourths}$
- 16 $\dots\dots\dots + \dots\dots\dots + \dots\dots\dots + \frac{1}{5} + \dots\dots\dots = 1$

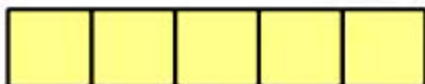
3 Decompose one whole into unit fractions, as in the example:

Example :



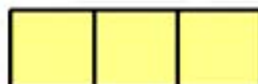
$$\frac{4}{4} = \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4}$$

1



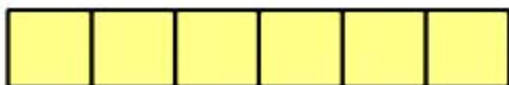
.....

2



.....

3



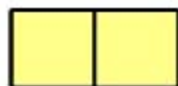
.....

4



.....

5



.....

4 Write a mathematical expression to decompose each of the following fractions into unit fractions, as in the example:

Example : $\frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} = \frac{4}{6}$

1 $\frac{3}{4} = \dots\dots\dots$

2 $\frac{2}{5} = \dots\dots\dots$

3 $\frac{2}{7} = \dots\dots\dots$

4 $\frac{4}{5} = \dots\dots\dots$

5 $\frac{3}{6} = \dots\dots\dots$

6 $\frac{4}{9} = \dots\dots\dots$

7 $\frac{2}{8} = \dots\dots\dots$

8 $\frac{3}{10} = \dots\dots\dots$

5 Decompose each of the following fractions in two different ways:

1 $\frac{4}{9} = \dots\dots + \dots\dots$

$\frac{4}{9} = \dots\dots + \dots\dots + \dots\dots$

2 $\frac{3}{5} = \dots\dots + \dots\dots$

$\frac{3}{5} = \dots\dots + \dots\dots + \dots\dots$

3 $\frac{3}{4} = \dots\dots + \dots\dots$

$\frac{3}{4} = \dots\dots + \dots\dots + \dots\dots$

4 $\frac{5}{8} = \dots\dots + \dots\dots$

$\frac{5}{8} = \dots\dots + \dots\dots + \dots\dots$

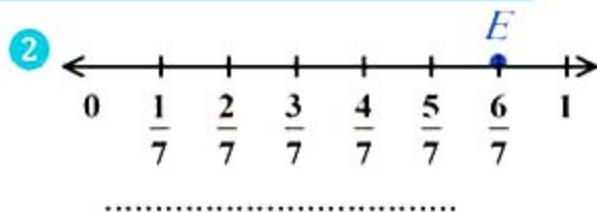
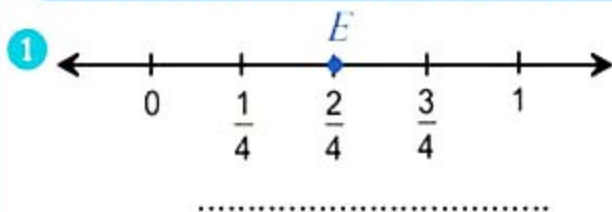
5 $\frac{7}{9} = \dots\dots + \dots\dots$

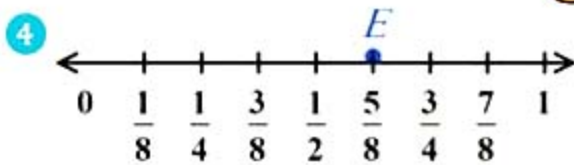
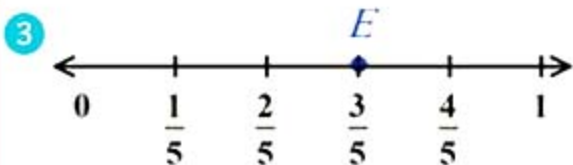
$\frac{7}{9} = \dots\dots + \dots\dots + \dots\dots$

6 $\frac{6}{13} = \dots\dots + \dots\dots$

$\frac{6}{13} = \dots\dots + \dots\dots + \dots\dots$

6 Locate point E on the number line for each of the following and state how many unit fractions make up the fraction.





7 Write how many unit fractions make each of the following:

1 $\frac{4}{6}$

2 $\frac{2}{3}$

3 $\frac{6}{7}$

4 $\frac{4}{4}$

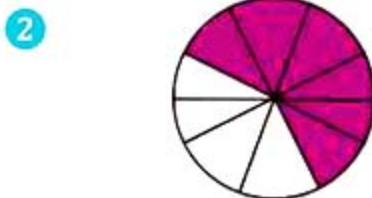
5 Five Eighths.....

6 Three Sixths.....

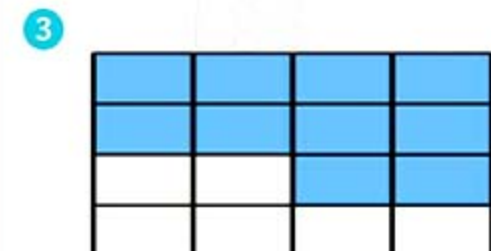
8 Write the proper fraction that represents each model. Then, use it to write as many equations as you can showing how to compose or decompose each one:



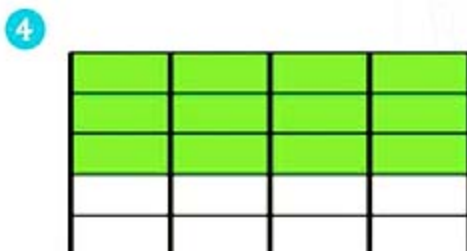
.....



.....



.....



.....

9 Read and Answer :

- 1 Mazen needs $\frac{3}{4}$ of a cup of sugar to make a cake. He has a measuring cup that can hold $\frac{1}{4}$ of a cup of sugar. How many times does Mazen need to fill his cup to complete the recipe?



- 2 Omar wants to paint $\frac{5}{9}$ of a wall using two different colours.

Decompose the fraction in two different ways using equations and models to help Omar paint the wall



- 3 Omar ate $\frac{1}{7}$ of a bag of popcorn. He and his brother shared the rest of the bag.

Write two equations that show two different ways to divide the remaining popcorn.

- 4 Basma bought a bottle of oil with a capacity of $\frac{5}{6}$ liter. She uses $\frac{1}{6}$ liter per day. Write the equation that represents the number of days she can use the bottle before it is empty.



- 5 Mazen needs $\frac{3}{5}$ kg of sugar to make a cake. He has a measuring cup that holds $\frac{1}{5}$ kg. Write the equation that represents how many times he needs to use the cup.





Fractions and Mixed Numbers

Learn 1 Fractions and Mixed Numbers

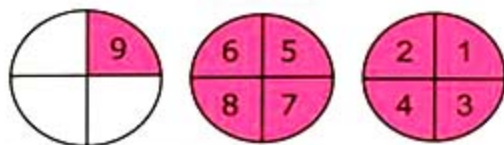
Proper fractions: are fractions in which the numerator is **smaller** than the denominator
 numerator < denominator

Example : $\frac{5}{8}$, $\frac{3}{4}$, $\frac{1}{2}$

Improper fractions: are fractions in which the numerator is greater than or equal to the denominator.
 numerator $\geq$ denominator

Example : $\frac{13}{8}$, $\frac{5}{5}$, $\frac{7}{2}$

➤ To write the **improper fraction** that represents the shaded part in the following model, we count the parts. For example:



➤ number of shaded parts = 9

➤ number of equal parts in one whole = 4

➤ The improper fraction that represents the shaded parts is = $\frac{9}{4}$

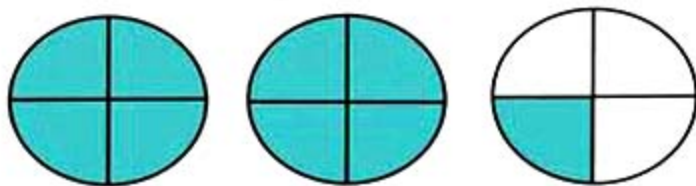
➤ A **proper fraction** has a value **less than 1**. An **improper fraction** has a value **equal to or greater than 1**.

A mixed number is a number that includes a **whole number** and a **proper fraction**.

Example : $8\frac{1}{5}$, $6\frac{7}{9}$, $2\frac{3}{4}$



➤ To write the **mixed number** that represents the shaded parts Count the number of whole and number of shaded parts in the next shape.



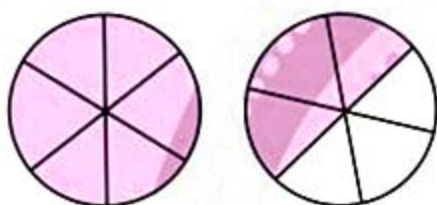
$$1 + 1 + \frac{1}{4} = 2\frac{1}{4}$$

Example 1

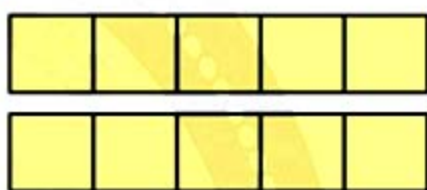


Write each model as both an improper fraction and a mixed number:

1



2



3



Solution



1 $1\frac{5}{6}$, $\frac{11}{6}$

2 2 , $\frac{10}{5}$

3 $2\frac{2}{3}$, $\frac{8}{3}$



Learn



2 Converting Between Mixed Numbers and Improper Fractions

To Convert an Improper Fraction to a Mixed Number

➤ To Convert an Improper Fraction to a Mixed Number Divide the numerator by the denominator. The quotient is the whole number, and the remainder is the numerator.

The denominator stays the same

Example:

$$\frac{5}{2} = 2 \frac{1}{2}$$

Whole number ← 2
 2 5
 - 4

 1
 (numerator) ← 1

To Convert a Mixed Number to an Improper Fraction

➤ To Convert a Mixed Number to an Improper Fraction Multiply the whole number by the denominator, then add the numerator.

The denominator stays the same.

Example:

$$2 \frac{1}{3} = \frac{(2 \times 3) + 1}{3} = \frac{7}{3}$$

Try by yourself



Complete :

1 + $7 \frac{5}{8} = 7$

2 $2 \frac{5}{7} = \frac{\dots\dots\dots}{\dots\dots\dots}$

3 $\frac{9}{6} = \dots\dots\dots \frac{\dots\dots\dots}{\dots\dots\dots}$

4 + $\frac{1}{5} = 3 \frac{1}{5}$



Mastering Fractions & Mixed Numbers

Proper vs. Improper Fractions



Proper Fractions
Less than 1
(numerator < denominator)



Improper Fractions
1 or greater

$$2 + \frac{1}{4}$$

Defining Mixed Numbers

Combines a whole number with a proper fraction.

$$3 \frac{1}{2} = \frac{(3 \times 2) + 1}{2} = \frac{7}{2}$$

Convert Mixed to Improper Fractions

Multiply the whole number by the denominator and add the numerator.

$$\frac{7}{2}$$

$7 \div 2 = 3$ with Remainder 1

$$3 \frac{1}{2}$$

Convert Improper Fractions to Mixed

Divide the numerator by the denominator; the quotient is the whole number and the remainder is the new numerator.

Exercises on Fractions and Mixed Number



1 Choose the correct answer from the given options :

1 In an improper fraction, the numerator denominator.

☐ A $\geq$

☐ B $\neq$

☐ C $>$

☐ D $\leq$

2 the numerator is smaller than the denominator.

☐ A a proper fraction

☐ B an improper fraction

☐ C a mixed number

☐ D whole number

3 Which of the following is a proper fraction?

☐ A $\frac{13}{12}$

☐ B $1\frac{5}{9}$

☐ C $\frac{9}{8}$

☐ D $\frac{5}{8}$

4 $3\frac{1}{2}$ Called

☐ A a unit fraction

☐ B a proper fraction

☐ C an improper fraction

☐ D a mixed number

5 Which of the following represents an improper fraction?

☐ A $\frac{4}{5}$

☐ B $\frac{1}{3}$

☐ C $1\frac{2}{5}$

☐ D $\frac{5}{5}$

6 The mixed number $1\frac{3}{4}$ is equivalent to which improper fraction?

☐ A $\frac{5}{4}$

☐ B $\frac{13}{4}$

☐ C $\frac{15}{4}$

☐ D $\frac{7}{4}$

7 Which fraction is greater than 1 ?

☐ A $\frac{4}{5}$

☐ B $\frac{7}{5}$

☐ C $\frac{5}{8}$

☐ D $\frac{9}{10}$

8 $\frac{12}{10} =$

☐ A $1\frac{1}{12}$

☐ B $1\frac{1}{5}$

☐ C $1\frac{1}{2}$

☐ D $1\frac{1}{4}$

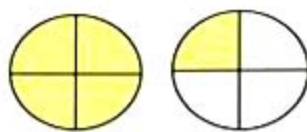
9 The improper fraction that represents the model is:

☐ A $1\frac{1}{4}$

☐ B $\frac{3}{4}$

☐ C $\frac{5}{4}$

☐ D $\frac{5}{8}$





2 Write as Mixed Numbers:

1 $\frac{15}{4} = \dots\dots\dots$

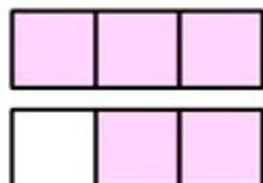
2 $\frac{5}{2} = \dots\dots\dots$

3 $\frac{11}{3} = \dots\dots\dots$

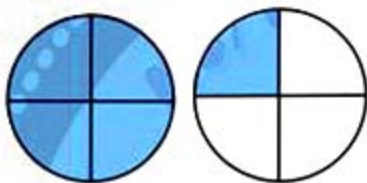
4 $\frac{13}{8} = \dots\dots\dots$

3 Put Circle the model that represents the given fraction:

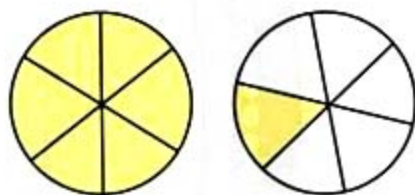
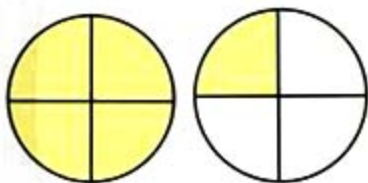
1 $1\frac{2}{3}$



2 $\frac{5}{4}$

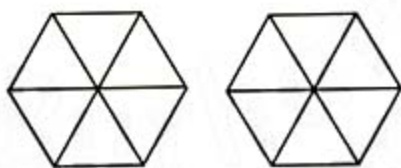


3 $\frac{7}{6}$



4 Shade the model to represent the given mixed number, then write it as an improper fraction:

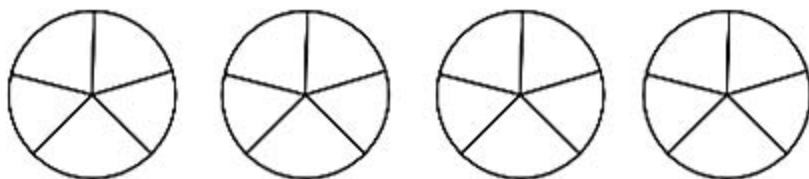
1 $1\frac{4}{6} = \dots\dots\dots$



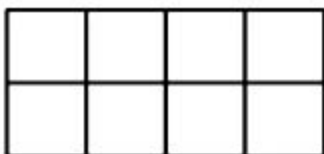
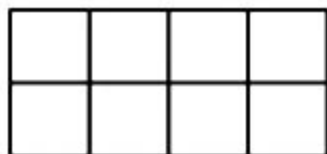
2 $2\frac{1}{3} = \dots\dots\dots$



3 $3\frac{1}{5} = \dots\dots\dots$



4 $2\frac{6}{8} = \frac{\dots\dots\dots}{\dots\dots\dots}$



5 Convert the mixed numbers fractions to their equivalent improper:

1 $3\frac{1}{6} = \dots\dots\dots$

2 $1\frac{1}{2} = \dots\dots\dots$

3 $2\frac{1}{8} = \dots\dots\dots$

4 $3\frac{1}{3} = \dots\dots\dots$

5 $5\frac{1}{4} = \dots\dots\dots$

6 $2\frac{1}{6} = \dots\dots\dots$

7 $2\frac{1}{11} = \dots\dots\dots$

8 $7\frac{2}{5} = \dots\dots\dots$

6 Convert the improper fractions to their equivalent mixed numbers:

1 $\frac{13}{3} = \dots\dots\dots$

2 $\frac{9}{5} = \dots\dots\dots$

3 $\frac{25}{10} = \dots\dots\dots$

4 $\frac{5}{4} = \dots\dots\dots$

7 Complete :

1 $\frac{13}{4} = \dots\dots\dots$

(mixed numbers)

2 $3\frac{1}{5} = \dots\dots\dots$

(improper fractions)

3 $6\frac{2}{3} = \dots\dots\dots$

(improper fractions)

4 $\frac{15}{2} = \dots\dots\dots$

(mixed numbers)



8 Express the following models as an improper fraction and as a mixed number:

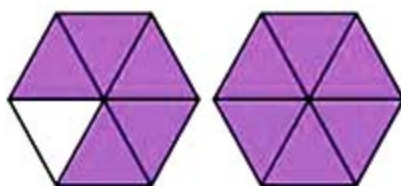
1



➤ Improper:.....

➤ mixed numbers:.....

2



➤ Improper:.....

➤ mixed numbers:.....

3



➤ Improper:.....

➤ mixed numbers:.....

4



➤ Improper:.....

➤ mixed numbers:.....

9 Read, then answer:

Mona baked a square-shaped cake for her mother's birthday. She wanted to decorate the edges of the cake's top surface using frosting. If the length of one side of the top face of

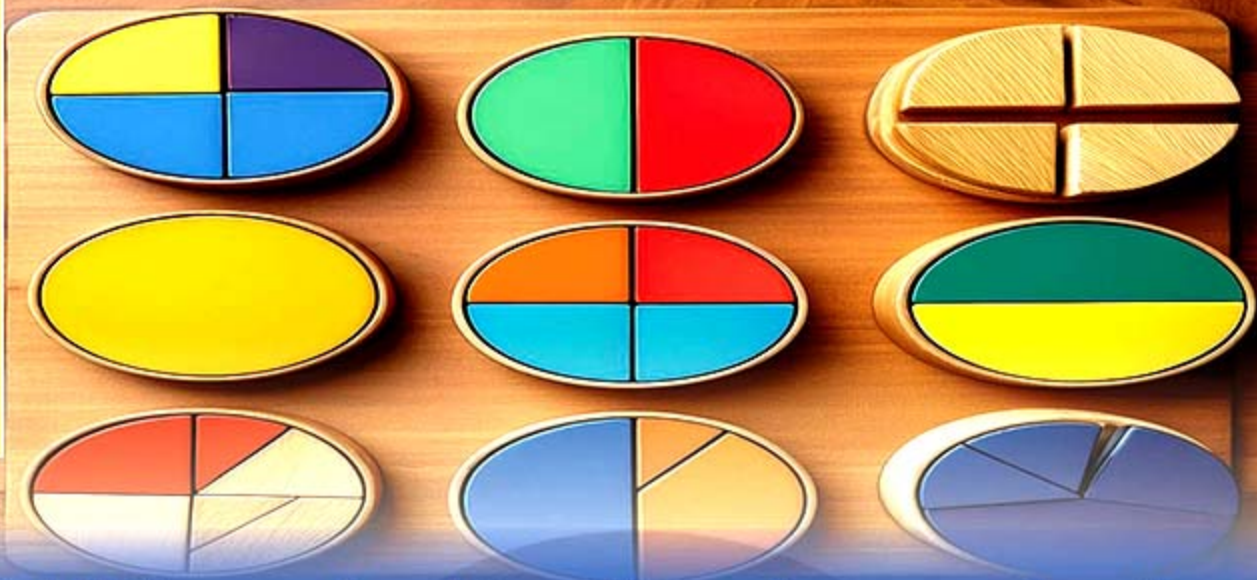


the cake is $\frac{3}{8}$ meter, what is the perimeter of the top face of the cake?

(Write the answer as a mixed number and as an improper fraction.)

.....

.....



Addition and subtraction of proper fractions

Learn



1 Adding proper fractions to whole numbers:

We can find the sum $2 + \frac{3}{5} + 1 + \frac{1}{5}$ using one of the following two methods

Method 1

Using models



$$2 + \frac{3}{5} + 1 + \frac{1}{5} = 3 + \frac{4}{5} = 3\frac{4}{5}$$

Method 2

We add the fractions together

$$2 + \frac{3}{5} + 1 + \frac{1}{5} = 3\frac{4}{5}$$

We add the whole numbers together

Notice that:

When adding fractions that have the same denominator, we add the numerators and keep the denominator the same.

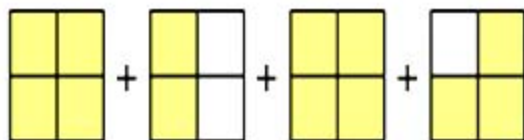


$$\frac{3}{5} + \frac{1}{5} = \frac{3+1}{5} = \frac{4}{5}$$

**Example 1**

Write the addition problem that represents the following models, then solve it:

1

**Solution**

1

$$1 + \frac{2}{4} + 1 + \frac{3}{4} = 2 + \frac{5}{4}$$

$$= 2 + 1\frac{1}{4} = 3\frac{1}{4}$$

Notice that:

- If the result is an improper fraction, it should be converted to an equivalent mixed number.
- If the result is an improper fraction, it should be converted to an equivalent mixed number.

Example 2

Complete :

1 $2 + 1 + \frac{3}{10} + \frac{2}{10} = \dots\dots\dots$

2 $\frac{5}{9} + \frac{3}{9} + \frac{3}{9} + 3 = \dots\dots\dots$

3 $1 + \frac{4}{5} + 1 + \frac{1}{5} = \dots\dots\dots$

Solution

1 $2 + 1 + \frac{3}{10} + \frac{2}{10} = 3\frac{5}{10} = 3\frac{1}{2}$

2 $\frac{5}{9} + \frac{3}{9} + \frac{3}{9} + 3 = 3\frac{11}{9} = 3 + 1\frac{2}{9} = 4\frac{2}{9}$

$$\frac{11}{9} = 1\frac{2}{9}$$

3 $1 + \frac{4}{5} + 1 + \frac{1}{5} = 2\frac{5}{5} = 2 + 1 = 3$

$$\frac{5}{5} = 1$$

Learn



2 Subtracting proper fractions from whole numbers

We can find the result of $1 - \frac{5}{6}$ using one of the following two methods:

Method 1

Using models

Draw a model representing the whole number, divide it into equal parts according to the denominator of the other fraction, then subtract by removing parts.



$$1 - \frac{5}{6} = \frac{1}{6}$$

Method 2

Convert the whole number to a fraction with the same denominator as the other fraction, then subtract the numerators and keep the denominator the same.

$$1 - \frac{5}{6} = \frac{6}{6} - \frac{5}{6} = \frac{6-5}{6} = \frac{1}{6}$$

Note that:



Any whole number can be written as a proper fraction. For example:

$$> 1 = \frac{1}{1} = \frac{2}{2} = \frac{3}{3} = \frac{4}{4} = \dots\dots\dots$$

$$> 2 = \frac{2}{1} = \frac{4}{2} = \frac{6}{3} = \frac{8}{4} = \dots\dots\dots$$

$$> 3 = \frac{3}{1} = \frac{6}{2} = \frac{9}{3} = \frac{12}{4} = \dots\dots\dots$$

$$> 5 = \frac{5}{1} = \frac{10}{2} = \frac{15}{3} = \frac{20}{4} = \dots\dots\dots$$

Try by yourself



Find the result of each of the following:

$$1 \quad 2 - \frac{2}{4} = \dots\dots\dots$$

$$2 \quad 1 + \frac{1}{6} + 3 + \frac{3}{6} = \dots\dots\dots$$

$$3 \quad \left(2 - \frac{1}{3}\right) - \frac{2}{3} = \dots\dots\dots$$

Example 3



Omar and his friend Hadi decided to bake some bread for their classmates. Omar baked one loaf, and Hadi also baked one loaf. If each of them gave $\frac{1}{3}$ of their loaf to their family,

how much bread do they have left to give to their classmates? (Assuming both loaves are the same size)

Solution



The amount of bread left with each of them: $= \frac{2}{3}$ of a loaf

(Because: $1 - \frac{1}{3} = \frac{3}{3} - \frac{1}{3} = \frac{2}{3}$)

The total bread left with Omar and Hadi to give to their classmates $1 \frac{1}{3}$ of a loaf

(Because: $\frac{2}{3} + \frac{2}{3} = \frac{4}{3} = 1 \frac{1}{3}$)



Example 4



Nader bought a pizza. If he ate $\frac{7}{8}$ of the pizza, calculate the remaining part of the pizza.



Solution



The remaining part of the pizza is $= \frac{1}{8}$ of a pizza

(Because $1 - \frac{7}{8} = \frac{8}{8} - \frac{7}{8} = \frac{1}{8}$)

Try by yourself



Read and complete :

Nada and Abeer each have a candy bar of the same type and size.

Nada ate $\frac{3}{4}$ of her candy bar, and Abeer ate $\frac{3}{4}$ of her candy bar.

The total amount of candy eaten by Nada and Abeer is



.....

.....



MASTERING FRACTIONS WITH WHOLE NUMBERS

1. GROUP WHOLE NUMBERS & FRACTIONS

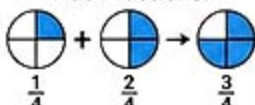


$$2\frac{1}{4} + 1\frac{2}{4} = ?$$

Combine Whole:

$$2 + 1 = 3$$

Add Fractions:



$$3\frac{3}{4}$$

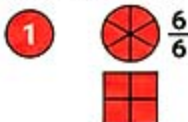
When adding, combine the whole numbers together and then add the fractions with like denominators.

2. CONVERT WHOLE NUMBERS FOR SUBTRACTION



$$1 - \frac{1}{6} = ?$$

Rewrite Whole:



Subtract Numerators:



$$5/6$$

To subtract, rewrite the whole number as a fraction (e.g., $1 = 6/6$) to match the denominator.

3. SIMPLIFY IMPROPER FRACTION RESULTS



$$\text{Answer: } \frac{5}{4}$$

Convert to Mixed:



$$1\frac{1}{4}$$

If your answer is an improper fraction, always convert it back into an equivalent mixed number.

4. SAME DENOMINATOR, SIMPLE MATH

NUMERATOR (CHANGES)



DENOMINATOR (REMAINS CONSTANT)

$$\frac{3}{8} + \frac{2}{8} = \frac{5}{8}$$

STAYS THE SAME

Only the numerators change during addition or subtraction; the denominator remains constant.

Exercises on Addition and subtraction of proper fractions



1 Choose the correct answer from the given options :

1 $\frac{7}{8} - \frac{4}{8} = \dots\dots\dots$

(A) $\frac{11}{8}$

(B) $\frac{3}{8}$

(C) $\frac{5}{8}$

(D) $\frac{3}{16}$

2 $\frac{4}{9} + \frac{5}{9} = \dots\dots\dots$

(A) $\frac{1}{9}$

(B) $\frac{9}{18}$

(C) 1

(D) $\frac{20}{81}$

3 $4 + \frac{4}{3} = \dots\dots\dots$

(A) $4\frac{1}{3}$

(B) $\frac{16}{4}$

(C) $\frac{12}{3}$

(D) $5\frac{1}{3}$

4 $2 - \frac{3}{6} = \dots\dots\dots$

(A) $1\frac{1}{2}$

(B) 1

(C) $\frac{4}{6}$

(D) $\frac{8}{9}$

5 $4 + \frac{4}{8} + 2 + \frac{5}{8} = \dots\dots\dots$

(A) $4\frac{7}{8}$

(B) $7\frac{1}{8}$

(C) $1\frac{7}{8}$

(D) $\frac{15}{8}$

2 Complete :

1 $4 + \frac{4}{8} + 2 + \frac{3}{8} = \dots\dots\dots$

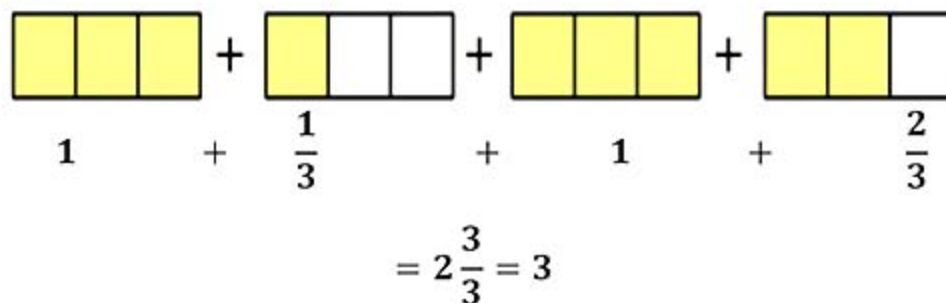
2 $\frac{5}{9} - \frac{4}{9} = \dots\dots\dots$

3 $1 - \frac{3}{7} = \dots\dots\dots$

4 $\frac{4}{9} + \frac{5}{5} = \dots\dots\dots$

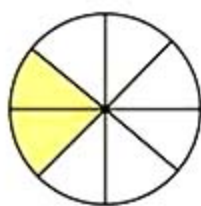
3 Write the addition problem that represents the following models, then solve it as in the example:

Example :



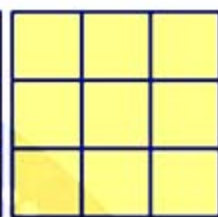
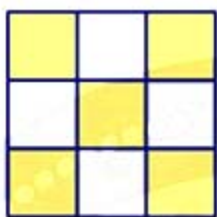
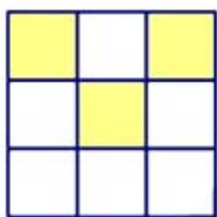


1



$$\dots\dots\dots + \dots\dots\dots + \dots\dots\dots = \dots\dots\dots$$

2



$$\dots\dots\dots + \dots\dots\dots + \dots\dots\dots = \dots\dots\dots$$

3



$$\dots\dots\dots + \dots\dots\dots + \dots\dots\dots + \dots\dots\dots + \dots\dots\dots = \dots\dots\dots$$

4 Draw a model to solve the following problems:

1 $3 - \frac{1}{3} = \dots\dots\dots$

2 $1 - \frac{2}{8} = \dots\dots\dots$

3 $2 - \frac{2}{3} = \dots\dots\dots$

5 Find the sum of each of the following as a mixed number, if possible:

1 $4 + \frac{4}{8} + 2 + \frac{5}{8} = \dots\dots\dots$

2 $2 + 2 + \frac{3}{5} + \frac{3}{5} = \dots\dots\dots$

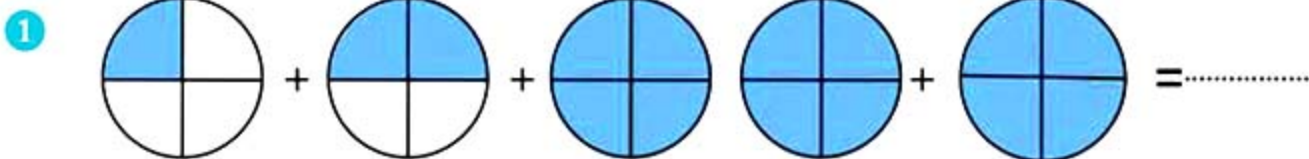
3 $1 + \frac{5}{6} + 3 + \frac{1}{6} = \dots\dots\dots$

4 $\frac{10}{12} + \frac{1}{12} + 3 + 2 = \dots\dots\dots$

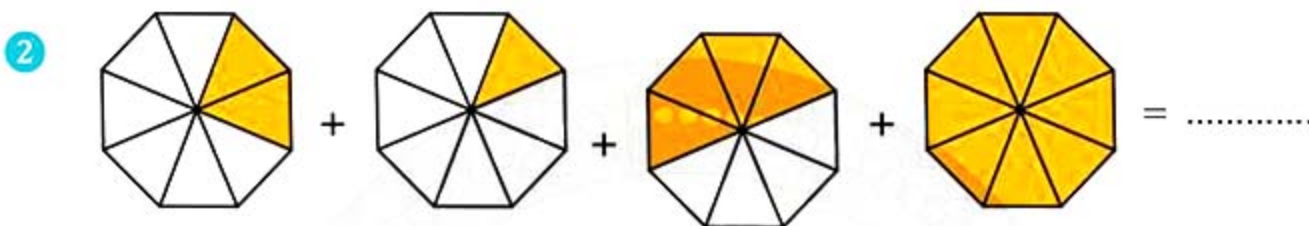
5 $\frac{2}{3} + 3 + \frac{2}{3} + 1 = \dots\dots\dots$

6 $1 + 1 + \frac{1}{4} + \frac{2}{4} = \dots\dots\dots$

6 Rewrite the problem using whole numbers and proper fractions, then add:



..... + + + =



..... + + + =



..... + + + + =

7 Find the sum:

1 $\frac{3}{5} + \frac{2}{5} = \dots\dots\dots$

2 $1 + 3 + \frac{2}{5} = \dots\dots\dots$

3 $2 + \frac{1}{4} + \frac{2}{4} = \dots\dots\dots$

4 $2 + \frac{5}{9} + 4 + \frac{3}{9} = \dots\dots\dots$

8 Find the difference:

1 $\frac{5}{6} - \frac{1}{6} = \dots\dots\dots$

2 $\frac{6}{8} - \frac{3}{8} = \dots\dots\dots$

3 $1 - \frac{2}{5} = \dots\dots\dots$

4 $1 - \frac{2}{8} = \dots\dots\dots$

5 $3 - \frac{1}{3} = \dots\dots\dots$

6 $2 - \frac{2}{3} = \dots\dots\dots$



9 Read, then answer:

- 1 Adam has one loaf of bread. He used $\frac{3}{4}$ of the loaf to make sandwiches. How much of the loaf is left?
-



- 2 Ahmed ate a whole orange, Duaa ate $\frac{1}{6}$ of an orange, and Makkah ate $\frac{4}{6}$ of an orange. What is the total amount eaten by Ahmed, Dua, and Makkah? (Assuming all oranges are the same size)
-



- 3 Fatima is cooking dinner for her family. She needs a full bottle of oil for frying. She has $\frac{1}{5}$ of a bottle, and $\frac{3}{5}$ of another bottle of the same size.



How much more does she need to have one full bottle?

.....

- 4 Nadia is making falafel for a big breakfast at one of her parties. Her recipe requires $\frac{1}{2}$ teaspoon of baking soda. This recipe serves 10 people, but Nadia has 40 guests, and she wants to multiply her recipe four times to serve everyone.



How many teaspoons of baking soda will she use in her recipe?

.....

Adding mixed numbers and subtracting mixed numbers

 Discover :

Add: $2\frac{1}{4} + 1\frac{2}{4} = ?$

Learn

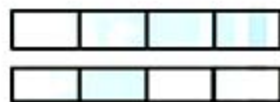


1 Adding mixed numbers with like denominators:

We can find the sum using one of the following methods:

Method 1

Using Models

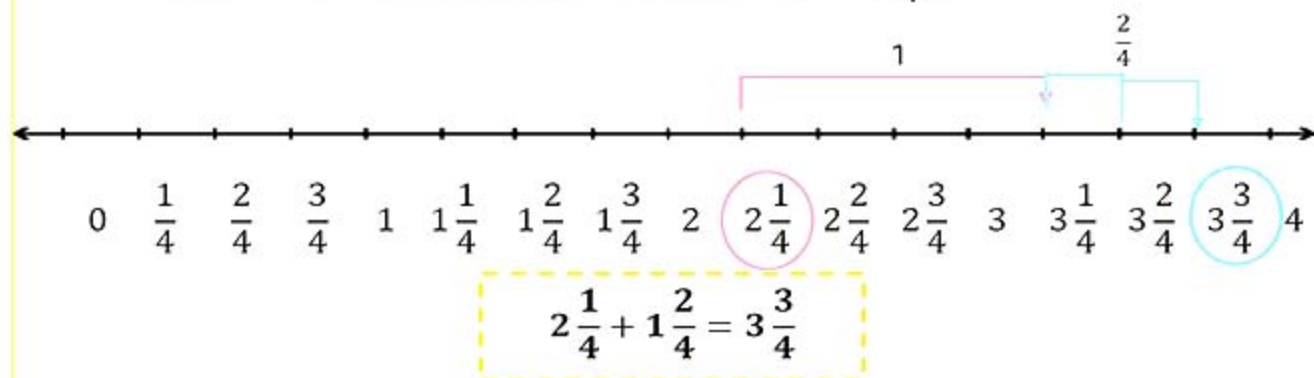


$$2\frac{1}{4} + 1\frac{2}{4} = 3\frac{3}{4}$$

Method 2

Using the Number Line

1. Locate the first mixed number ($2\frac{1}{4}$) on the number line.
2. Jump forward by the whole number in the second mixed number (1)
3. Then jump forward by the fractional part ($\frac{2}{4}$)



**Method 3**

Add the fractions together

$$2\frac{1}{4} + 1\frac{2}{4} = 3\frac{3}{4}$$

Add the whole numbers together

Learn 2**Subtracting mixed numbers with like denominators:**

Subtract $3\frac{4}{5} - 1\frac{3}{5} = ?$

We can find the difference using one of the following methods:

Method 1

Using Models

We represent the minuend (the larger mixed number) using models, then we subtract the smaller mixed number from it.



$3\frac{4}{5}$

-

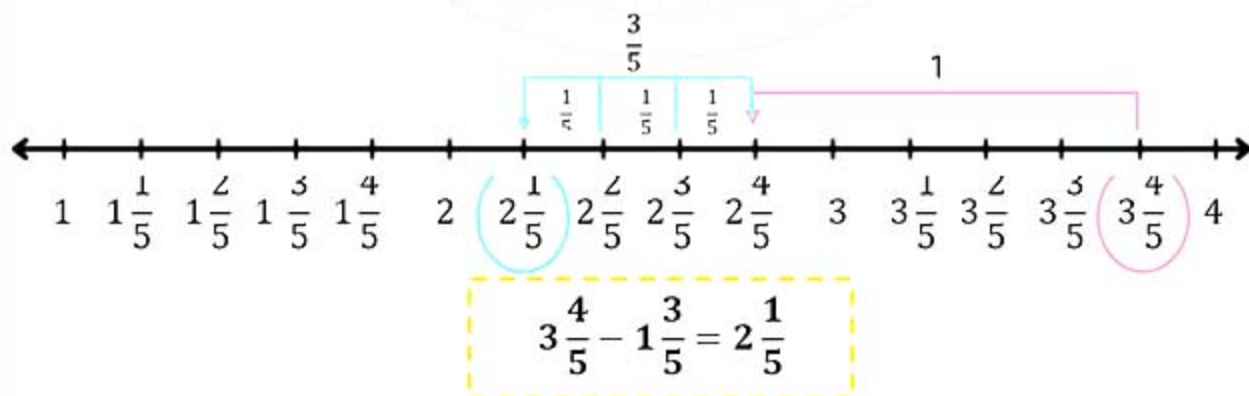
$1\frac{3}{5}$

$= 2\frac{1}{5}$

Method 2

Using the Number Line

1. Locate the larger mixed number ($3\frac{4}{5}$) on the number line
2. Jump **backward** by the whole number in the other mixed number (1)
3. Jump **backward** again by the fractional part ($\frac{3}{5}$)



Method 3

Subtract the fractions

$$3\frac{4}{5} - 1\frac{3}{5} = 2\frac{1}{5}$$

then subtract the whole

Example 1



Find the Result :

1 $1\frac{2}{6} + 2\frac{3}{6} = \dots\dots\dots$

2 $1\frac{1}{5} + \frac{4}{5} = \dots\dots\dots$

3 $1\frac{3}{4} + 3\frac{2}{4} = \dots\dots\dots$

4 $4\frac{5}{7} - 3\frac{2}{7} = \dots\dots\dots$

5 $5 - 2\frac{1}{3} = \dots\dots\dots$

6 $2\frac{1}{5} - 1\frac{2}{5} = \dots\dots\dots$

7 $6\frac{7}{9} - 2\frac{2}{9} = \dots\dots\dots$

8 $5 - 3\frac{2}{7} = \dots\dots\dots$

9 $10\frac{1}{6} - 2\frac{5}{6} = \dots\dots\dots$

Solution



1 $1\frac{2}{6} + 2\frac{3}{6} = 3\frac{5}{6}$

2 $1\frac{1}{5} + \frac{4}{5} = 1\frac{5}{5} = 2$

3 $1\frac{3}{4} + 3\frac{2}{4} = 4\frac{5}{4} = 5\frac{1}{4}$

4 $4\frac{5}{7} - 3\frac{2}{7} = 1\frac{3}{7}$

5 Rewrite the whole number(5) as a fractional number $\longrightarrow 5 = 4\frac{3}{3}$

$$5 - 2\frac{1}{3} = 4\frac{3}{3} - 2\frac{1}{3} = 2\frac{2}{3}$$

6 When subtracting fractions, we cannot subtract $\frac{2}{5}$ from $\frac{1}{5}$:

So, we rename $2\frac{1}{5}$ to $1\frac{6}{5}$ then we subtract.

$$2\frac{1}{5} - 1\frac{2}{5} = 1\frac{6}{5} - 1\frac{2}{5} = \frac{4}{5}$$

attention



$$\begin{aligned} 2\frac{1}{5} &= 2 + \frac{1}{5} \\ &= 1\frac{5}{5} + \frac{1}{5} = 1\frac{6}{5} \end{aligned}$$

7 $6\frac{7}{9} - 2\frac{2}{9} = 4\frac{5}{9}$

8 We rewrite the whole number (5) as a fractional number to become: $= 4\frac{7}{7}$

$$5 - 3\frac{2}{7} = 4\frac{7}{7} - 3\frac{2}{7} = 1\frac{5}{7}$$



- 9 We find that when subtracting fractions, $\left(\frac{5}{6}\right)$ from $\left(\frac{1}{6}\right)$ So,

we rename the fractions $10\frac{1}{6}$ to $9\frac{7}{6}$

$$10\frac{1}{6} - 2\frac{5}{6} = 9\frac{7}{6} - 2\frac{5}{6} = 7\frac{2}{6} = 7\frac{1}{3}$$

Example 2



Ahmed studied for $1\frac{4}{6}$ hours, then he studied again for $2\frac{5}{6}$ hours. Find the total number of hours that Ahmed studied.

Solution



To find the total number of hours that Ahmed studied, we follow these steps:

- 1 . We add the hours that Ahmed studied in the first time and the second time:

The total time that Ahmed studied: $1\frac{4}{6} + 2\frac{5}{6} = 3\frac{9}{6}$

- 2 . We convert the improper fraction $\left(\frac{9}{6}\right)$ into a mixed number

Converting to a mixed number: $\frac{9}{6} = \frac{6}{6} + \frac{3}{6} = 1\frac{3}{6} = 1\frac{1}{2}$

Therefore:

The total number of hours that Ahmed studied $4\frac{1}{2}$ hour

.(because $3\frac{9}{6} = 3 + \frac{9}{6} = 3 + 1\frac{1}{2} = 4\frac{1}{2}$)

Example 3



Hind bought $3\frac{1}{4}$ kg of sugar . If she used $1\frac{1}{4}$ kg for making sweets, and then used $1\frac{3}{4}$ kg for making juices

find the amount of sugar remaining with Hind

Solution



To find the amount of sugar remaining with Hind, we follow these steps:

1. We find the amount of sugar remaining with Hind after making the sweets:

The amount of sugar left after making the sweets $2 =$ kg,

because: $3\frac{1}{4} - 1\frac{1}{4} = 2$

2. We find the amount of sugar remaining with Hind after making the juices:

The amount of sugar left after making the juices $= \frac{1}{4}$ Kg

because: $2 - 1\frac{3}{4} = 1\frac{4}{4} - 1\frac{3}{4} = \frac{1}{4}$

Therefore: The amount of sugar remaining with Hind $\frac{1}{4}$ kg



attention

$$3 - 1 = 2$$

$$\frac{1}{4} - \frac{1}{4} = 0$$



attention

$$2 = 1\frac{4}{4}$$

Try by yourself



- 1 Ayman has 3 pies of the same type and size. He ate $1\frac{3}{4}$ pies . What fractional number represents the amount of pies left?

.....

.....

.....

- 2 Mariam bought $4\frac{1}{2}$ kilograms of sugar , $3\frac{1}{2}$ kilograms of flour, and $1\frac{1}{2}$ kilograms of rice . What is the total number of kilograms that Mariam bought?

.....

.....

.....



1 Choose the correct answer from the given options :

1 $3 + 1\frac{1}{5} = \dots\dots\dots$

(A) $2\frac{1}{5}$

(B) $1\frac{4}{5}$

(C) $4\frac{1}{5}$

(D) $\frac{4}{5}$

2 $2\frac{1}{2} - 1\frac{1}{2} = \dots\dots\dots$

(A) $\frac{1}{2}$

(B) 0

(C) $1\frac{1}{2}$

(D) 1

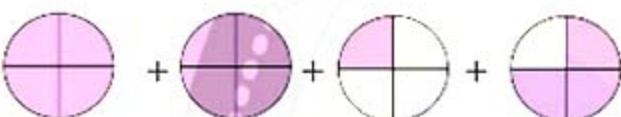
3 $3\frac{5}{8} - 1\frac{1}{8} = \dots\dots\dots$

(A) $1\frac{1}{2}$

(B) $1\frac{6}{8}$

(C) $2\frac{1}{2}$

(D) $2\frac{3}{8}$

4  $= \dots\dots\dots$

(A) $2\frac{1}{4}$

(B) $2\frac{1}{2}$

(C) $2\frac{3}{4}$

(D) 3

5 $\frac{2}{5} + 1\frac{4}{5} = \dots\dots\dots$

(A) $2\frac{1}{5}$

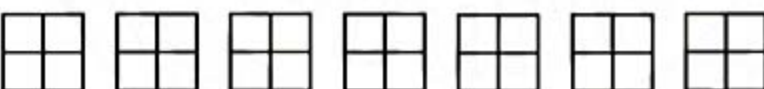
(B) $\frac{8}{5}$

(C) $\frac{6}{10}$

(D) 2

2 Find the Result Using Models and Number Lines:

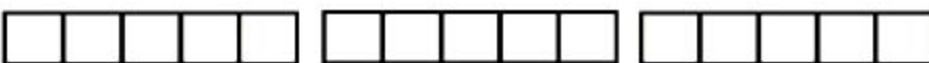
1 $4\frac{3}{4} + 2\frac{1}{4} = \dots\dots\dots$

Models: 

Number Lines:



2 $2\frac{1}{5} - 1\frac{2}{5} = \dots\dots\dots$

Models: 

Number Lines:



3 $3\frac{2}{5} - 2\frac{1}{5} = \dots\dots\dots$

Models:



Number Lines:



3 Find the Sum:

1 $\frac{5}{9} + \frac{3}{9} + \frac{4}{9} = \dots\dots = \dots\dots$

2 $\frac{4}{5} + \frac{2}{5} + \frac{3}{5} = \dots\dots = \dots\dots$

3 $\frac{2}{11} + \frac{5}{11} + \frac{7}{11} = \dots\dots = \dots\dots$

4 $\frac{2}{3} + \frac{4}{3} + \frac{1}{3} = \dots\dots = \dots\dots$

5 $3\frac{5}{12} + 1\frac{11}{12} = \dots\dots = \dots\dots$

6 $4\frac{2}{5} + 2\frac{3}{5} = \dots\dots = \dots\dots$

7 $4\frac{4}{5} + \frac{4}{5} = \dots\dots = \dots\dots$

8 $1\frac{3}{4} + 2\frac{2}{4} = \dots\dots = \dots\dots$

9 $2\frac{1}{3} + \frac{5}{3} = \dots\dots = \dots\dots$

4 Find the Difference:

1 $6\frac{2}{3} - 3\frac{1}{3} = \dots\dots\dots$

2 $3\frac{3}{4} - 1\frac{1}{4} = \dots\dots\dots$

3 $4\frac{2}{5} - 2\frac{1}{5} = \dots\dots\dots$

4 $8\frac{4}{5} - 5\frac{1}{5} = \dots\dots\dots$

5 $4\frac{3}{7} - 2\frac{2}{7} = \dots\dots\dots$

6 $5\frac{5}{6} - 3\frac{2}{6} = \dots\dots\dots$

5 Read, then answer:

1 Omar has 9 pounds. He gave his friend $5\frac{1}{2}$ pounds .

How many pounds does Omar have left

.....

.....

.....

2 Manal bought $4\frac{7}{8}$ liters of oil. If she used $3\frac{6}{8}$ liters of it

find the number of liters of oil remaining ?

.....

.....

.....





- 3 Ahmed drank $1\frac{3}{5}$ liters of water, and Mohamed drank $1\frac{2}{5}$ liters of water

What is the total number of liters of water that Ahmed and Mohamed drank?

- 4 Ayman has $4\frac{1}{4}$ chocolate bars. He gave Youssef $2\frac{3}{4}$ chocolate bars

Find the number of chocolate bars that Ayman has left



ADDING & SUBTRACTING MIXED NUMBERS

Quick guide for mixed numbers with like denominators.

Adding Mixed Numbers (e.g., $2\frac{1}{4} + 1\frac{2}{4}$)

1. Add The Fractions

$$\frac{1}{4} + \frac{2}{4} = \frac{3}{4}$$

Add top numbers (numerators).

2. Add The Whole Numbers

$$2 + 1 = 3$$

Add large whole numbers together.

3. Combine For The Answer

$$3\frac{3}{4}$$

Combine whole number and new fraction.

Subtracting Mixed Numbers (e.g., $3\frac{4}{5} - 1\frac{3}{5}$)

1. Subtract The Fractions

$$\frac{4}{5} - \frac{3}{5} = \frac{1}{5}$$

Subtract top numbers (numerators).

2. Subtract The Whole Numbers

$$3 - 1 = 2$$

Subtract large whole numbers.

3. Combine For The Answer

$$2\frac{1}{5}$$

Combine whole number and new fraction.

Can't subtract? Regroup!

If the first fraction is smaller than the second (e.g., in $2\frac{1}{5} - 1\frac{3}{5}$), borrow from the whole number. $2\frac{1}{5}$ becomes $1\frac{6}{5}$.

Comparing fractions with like denominators or numerators

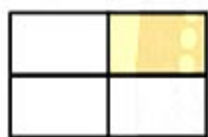
Learn



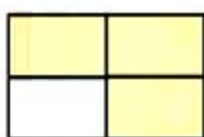
1 Comparing Fractions

Comparing Fractions

If they have (the same denominator) :



$$\frac{1}{4}$$



$$\frac{3}{4}$$

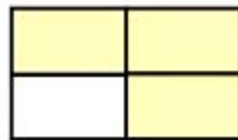
So in general:

If two fractions have the same denominator, the one with the greater numerator is the greater fraction.

If they have (the same Numerator) :



$$\frac{3}{8}$$



$$\frac{3}{4}$$

So in general:

If two fractions have the same numerator, the one with the smaller denominator is the greater fraction.

**Example 1**

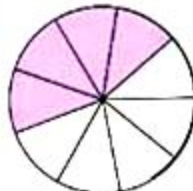
Write the fraction that represents the shaded part in each figure then compare using $(=)$, $(<)$, $(>)$

1

.....
.....



.....
.....

2

.....
.....



.....
.....

Solution

1 $\frac{2}{4} > \frac{2}{8}$

2 $\frac{4}{9} < \frac{6}{9}$

Example 2

Compare using $(<)$, $(>)$, $(=)$:

1 $\frac{5}{8}$ $\frac{3}{8}$

2 $\frac{2}{7}$ $\frac{4}{7}$

3 $\frac{2}{11}$ $\frac{2}{9}$

4 $\frac{1}{3}$ $\frac{1}{10}$

5 $\frac{1}{6}$ $\frac{6}{6}$

6 $\frac{3}{5}$ $\frac{3}{4}$

Solution

1 $>$

2 $<$

3 $<$

4 $>$

5 $<$

6 $<$

Try by yourself

Compare using $(<)$, $(>)$, $(=)$:

1 $\frac{4}{7}$ $\frac{6}{7}$

2 $\frac{5}{8}$ $\frac{5}{6}$

3 $\frac{1}{4}$ $\frac{1}{10}$

4 $\frac{9}{4}$ $\frac{11}{4}$

5 $\frac{8}{7}$ $\frac{8}{5}$

6 $\frac{13}{6}$ $\frac{12}{6}$

Learn



2 Ordering Fractions with the Same Denominator or Same Numerator

Example 3



Arrange the following fractions as required:

- 1 $\frac{7}{2}, \frac{7}{5}, \frac{7}{10}, \frac{7}{4}, \frac{7}{12}$ Descending order 2 $\frac{4}{9}, \frac{7}{9}, \frac{8}{9}, \frac{5}{9}, \frac{1}{9}$ Ascending order

Solution



- 1 the fractions have the same numerator 2 the fractions have the same denominator
the one with the **smaller denominator** the one with the **greater numerator**

is the **greater**is the **greater**Order $\frac{7}{2}, \frac{7}{4}, \frac{7}{5}, \frac{7}{10}, \frac{7}{12}$ Order: $\frac{1}{9}, \frac{4}{9}, \frac{5}{9}, \frac{7}{9}, \frac{8}{9}$

Try by yourself



Arrange the following fractions:

- 1 $\frac{3}{10}, \frac{5}{10}, \frac{2}{10}, \frac{1}{10}$ Ascending order 2 $\frac{9}{5}, \frac{9}{9}, \frac{9}{4}, \frac{9}{2}$ Descending order

.....

.....



How to Compare Fractions

Learn two simple rules to quickly determine which fraction is **bigger**.Rule 1:
Same Bottom NumberWhen the denominators are the same, the fraction with the **bigger top number (numerator)** is the greater fraction.Rule 2:
Same Top NumberWhen the **numerators** are the same, the fraction with the **smaller bottom number (denominator)** is the greater fraction.

Exercises on Comparing fractions with like denominators or numerators



1 Choose the correct answer from the given options :

- 1 $< \frac{7}{8}$
 (A) 1 (B) $\frac{7}{8}$ (C) $\frac{8}{7}$ (D) $\frac{5}{8}$
- 2 $\frac{3}{5}$ $\frac{3}{7}$
 (A) $<$ (B) $>$ (C) $=$ (D) otherwise
- 3 $\frac{3}{9} > \frac{\text{.....}}{9}$
 (A) 1 (B) 3 (C) 5 (D) 7
- 4 $\frac{1}{7} < \frac{1}{\text{.....}}$
 (A) 9 (B) 8 (C) 7 (D) 6
- 5 $\frac{2}{4}$ $\frac{3}{4}$
 (A) $<$ (B) $>$ (C) $=$ (D) otherwise
- 6 $\frac{5}{7}$ $\frac{5}{10}$
 (A) $<$ (B) $>$ (C) $=$ (D) otherwise
- 7 $\frac{5}{3}$ $\frac{1}{3}$
 (A) $<$ (B) $>$ (C) $=$ (D) otherwise
- 8 $\frac{1}{5} < \frac{1}{\text{.....}}$
 (A) 3 (B) 5 (C) 7 (D) 10
- 9 $\frac{2}{8} > \frac{\text{.....}}{8}$
 (A) 5 (B) 6 (C) 8 (D) 1
- 10 $< \frac{4}{9}$
 (A) $\frac{8}{9}$ (B) $\frac{1}{9}$ (C) $\frac{5}{9}$ (D) 1

2 Compare using ($<$), ($>$), ($=$) :

1 $\frac{1}{3}$ $\frac{2}{3}$

2 $\frac{3}{10}$ $\frac{7}{10}$

3 $\frac{4}{9}$ $\frac{2}{9}$

4 $\frac{1}{5}$ $\frac{3}{5}$

5 $\frac{3}{4}$ $\frac{2}{4}$

6 $\frac{3}{8}$ $\frac{5}{8}$

7 $\frac{11}{12}$ $\frac{10}{12}$

8 $\frac{10}{13}$ $\frac{7}{13}$

9 $\frac{1}{6}$ $\frac{2}{6}$

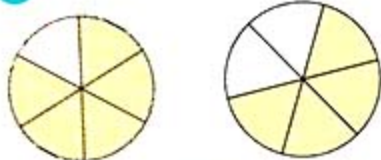
10 $\frac{1}{6}$ $\frac{4}{11}$

11 $\frac{1}{6}$ $\frac{3}{4}$

12 $\frac{7}{8}$ $\frac{7}{11}$

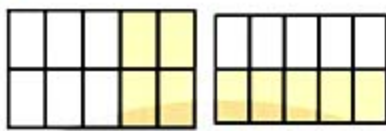
3 Shade and Compare Using (<), (>), (=):

1



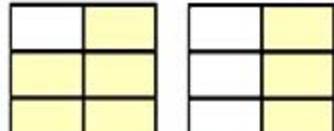
.....

2



.....

3



.....

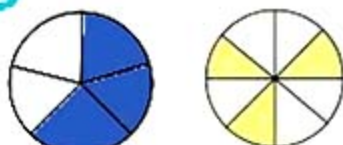
4 Shade Each Model to Represent the Given Fractions, Then Compare Using (<), (>), (=):

1



$\frac{1}{6}$ $\frac{1}{4}$

2



$\frac{2}{6}$ $\frac{2}{8}$

3



$\frac{4}{5}$ $\frac{3}{5}$

5 Arrange the Fractions as Required:

1 $\frac{3}{7}$, $\frac{1}{7}$, $\frac{5}{7}$, $\frac{4}{7}$ (Ascending)

2 $\frac{3}{10}$, $\frac{9}{10}$, $\frac{1}{10}$, $\frac{7}{10}$ (Descending)

3 $\frac{1}{17}$, $\frac{1}{5}$, $\frac{1}{10}$, $\frac{1}{8}$ (Ascending)

4 $\frac{3}{4}$, $\frac{3}{10}$, $\frac{3}{11}$, $\frac{3}{3}$ (Descending)

6 read and answer :

1 Mohamed ran $\frac{4}{7}$ km, while Ahmed ran $\frac{5}{7}$ km.

Who ran a shorter distance?

2 Mona ate $\frac{4}{6}$ of a candy bar, and Huda ate $\frac{4}{8}$ of the same-sized bar. Who ate more?

The same fraction in different forms

Learn



1 Adding mixed numbers with like denominators:

Equivalent Fractions : They are fractions that have different numerators and denominators but have the same value

The fractions shaded with the same color

in the fraction wall are equivalent as follows:

$$\rightarrow \frac{1}{2} = \frac{2}{4} = \frac{4}{8} = \frac{5}{10} = \dots$$

$$\rightarrow \frac{1}{3} = \frac{2}{6} = \frac{4}{12} = \dots$$

1											
$\frac{1}{2}$						$\frac{1}{2}$					
$\frac{1}{3}$				$\frac{1}{3}$				$\frac{1}{3}$			
$\frac{1}{4}$			$\frac{1}{4}$			$\frac{1}{4}$			$\frac{1}{4}$		
$\frac{1}{5}$		$\frac{1}{5}$		$\frac{1}{5}$		$\frac{1}{5}$		$\frac{1}{5}$		$\frac{1}{5}$	
$\frac{1}{6}$		$\frac{1}{6}$		$\frac{1}{6}$		$\frac{1}{6}$		$\frac{1}{6}$		$\frac{1}{6}$	
$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$
$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$
$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$

Example 1



Shade to make a fraction equivalent to the shaded one:

1

$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$
$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$

2

$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$
$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$

Solution



1

$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$
$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$

$$\frac{1}{6} = \frac{2}{12}$$

2

$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$
$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$

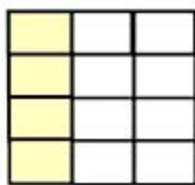
$$\frac{3}{5} = \frac{6}{10}$$

Example 2

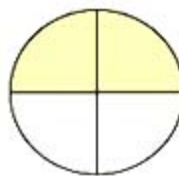


Using the shaded parts in the following models, write two equivalent fractions:

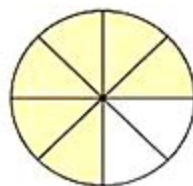
1



2



3



Solution



$$1 \quad \frac{3}{4} = \frac{6}{8}$$

$$2 \quad \frac{1}{2} = \frac{2}{4}$$

$$3 \quad \frac{1}{3} = \frac{4}{12}$$



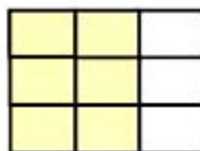
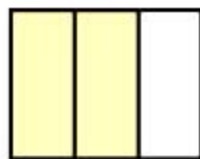
Example 3



Mariam bought 9 apples, and $\frac{2}{3}$ of them are red ,

How many red apples does Mariam have?

(Use the given model.)



Solution



the number of red apples 6 = apples (because : $\frac{2}{3} = \frac{6}{9}$)

Try by yourself



Read and answer :

Khaled has 15 pens, and $\frac{3}{5}$ of them are red



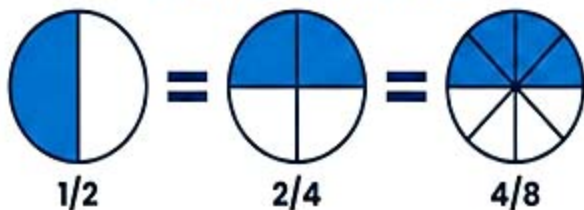
Find the number of red pens Khaled has, using the given model



What Are Equivalent Fractions?

Same Value, Different Numbers. Equivalent fractions have different numerators and denominators but represent the same amount.

See The Equivalence



These fractions are equal: $\frac{1}{2} = \frac{2}{4} = \frac{4}{8}$.

Fractions in Real Life



If Mariam has 9 apples and $\frac{2}{3}$ of them are red, she has 6 red apples.

$$\frac{2}{3} = \frac{6}{9}$$

Exercises on The same fraction in different forms



1 Choose the correct answer from the given options :

1 Which of the following fractions is equivalent to $\frac{4}{8}$

(A) $\frac{1}{9}$

(B) $\frac{1}{3}$

(C) $\frac{1}{2}$

(D) $\frac{1}{4}$

2 = $\frac{1}{2}$

(A) $\frac{2}{5}$

(B) $\frac{1}{5}$

(C) $\frac{5}{10}$

(D) $\frac{3}{5}$

3 $\frac{2}{3} = \frac{6}{\dots\dots\dots}$

(A) 6

(B) 7

(C) 8

(D) 9

4 $\frac{1}{3} = \frac{\dots\dots\dots}{9}$

(A) 1

(B) 2

(C) 3

(D) 4

5 = $\frac{3}{5}$

(A) $\frac{6}{10}$

(B) $\frac{3}{10}$

(C) $\frac{6}{5}$

(D) $\frac{10}{10}$

6 From the given model:

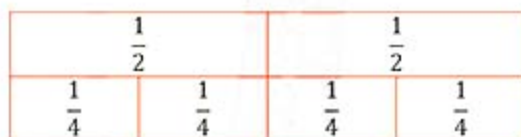
The proper fraction equivalent to $\frac{1}{2}$ is

(A) $\frac{1}{4}$

(B) $\frac{2}{4}$

(C) $\frac{3}{4}$

(D) 4



7 From the given model:

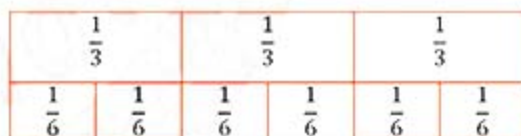
The proper fraction equivalent to $\frac{2}{3}$ is

(A) $\frac{4}{6}$

(B) $\frac{2}{6}$

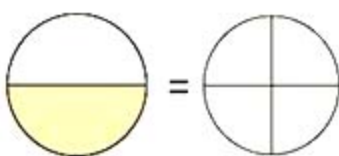
(C) $\frac{4}{3}$

(D) 6



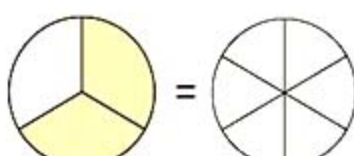
2 Write the fraction that represents the shaded part, then shade and write its equivalent fraction in each of the following:

1



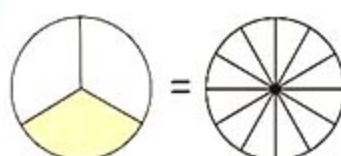
..... =

2



..... =

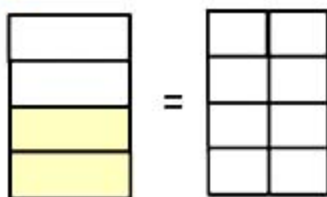
3



..... =

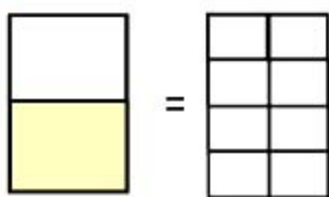


4



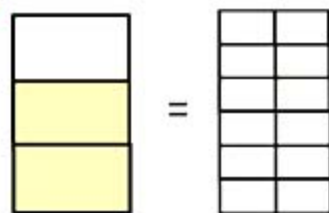
$$\frac{2}{4} = \frac{4}{8}$$

5



$$\frac{1}{4} = \frac{2}{8}$$

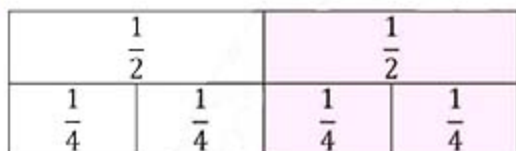
6



$$\frac{2}{4} = \frac{4}{8}$$

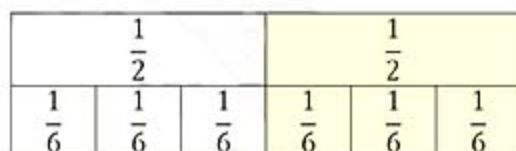
3 Complete by writing the two equivalent fractions as shown in the example :

1



$$\frac{1}{2} = \frac{2}{4}$$

2



$$\frac{1}{2} = \frac{3}{6}$$

3



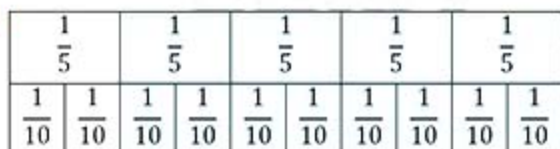
$$\frac{1}{4} = \frac{2}{8}$$

4



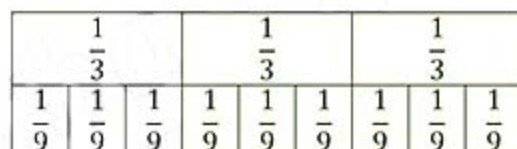
$$\frac{1}{6} = \frac{2}{12}$$

5



$$\frac{1}{5} = \frac{2}{10}$$

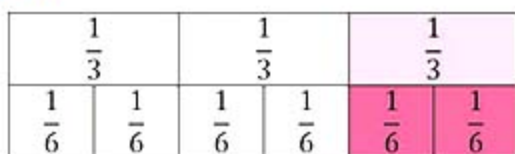
6



$$\frac{1}{3} = \frac{3}{9}$$

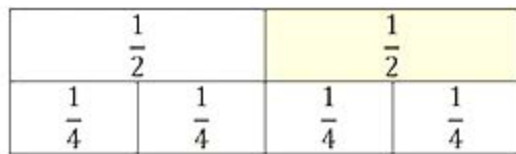
4 Shade to make an equivalent fraction to the given fraction, then write it, as in the example.

Example



$$\frac{1}{3} = \frac{2}{6}$$

1



$$\frac{1}{2} = \frac{2}{4}$$

5 Complete the following (using the given model):

1 $\frac{\dots}{4} = \frac{1}{2}$

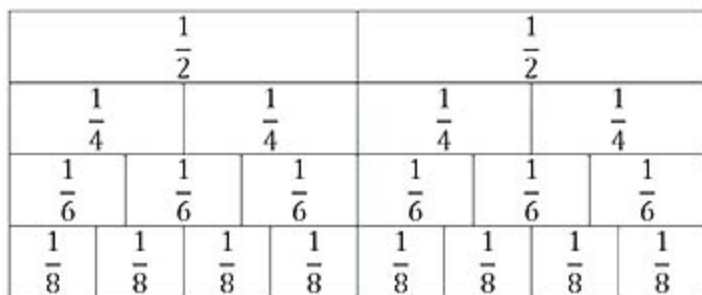
2 $\frac{\dots}{6} = \frac{1}{2}$

3 $\frac{2}{\dots} = \frac{1}{4}$

4 $\frac{4}{8} = \frac{1}{\dots}$

5 $\frac{\dots}{8} = \frac{4}{4}$

6 $\frac{4}{\dots} = \frac{2}{4}$



6 read and answer :

- 1 Jana and Habiba each have a cake of the same type and size ,Jana ate $\frac{1}{4}$ of her cake .
and Habiba divided her cake into 8 equal pieces

How many pieces should Habiba eat to have the same amount as Jana?



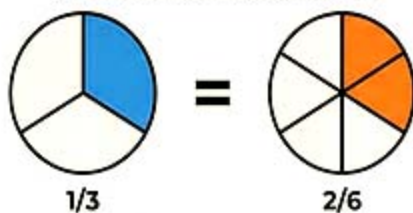
Same Value, Different Look: A Guide to Equivalent Fractions

What Are Equivalent Fractions?



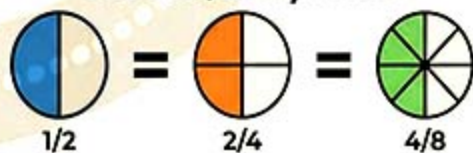
They are fractions with different numerators and denominators that have the same value.

A Third Can Be a Sixth



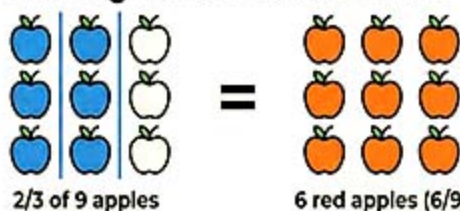
The fraction $\frac{1}{3}$ is equal to the fraction $\frac{2}{6}$.

One Half, Many Forms



The fractions $\frac{1}{2}$, $\frac{2}{4}$, and $\frac{4}{8}$ all represent the exact same amount.

Finding a Fraction of a Whole



To find $\frac{2}{3}$ of 9 apples, we see that $\frac{2}{3}$ is equivalent to $\frac{6}{9}$, which means there are 6 red apples.



Benchmark fractions and applications of benchmark fractions

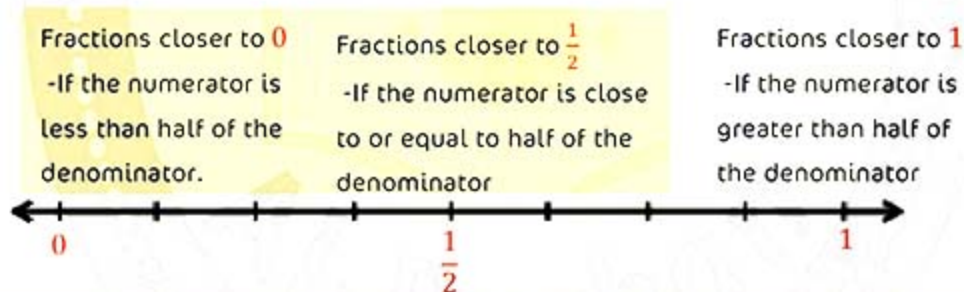
Learn



1 benchmark fractions :

benchmark fractions : They are special numerical values, such as 1 , 0 , $\frac{1}{2}$. They are common fractions that help us to compare other fractions.

We can determine the benchmark fraction that is closest to any proper fraction by using the following diagram:



! Note

- There are some fractions equivalent to the benchmark fraction $\frac{1}{2}$ such as :
 $\frac{4}{8} = \frac{3}{6} = \frac{2}{4} = \frac{1}{2}$ and so on.
- All the fractions equivalent to $\frac{1}{2}$ have a numerator equal to half of their denominator.
- There are also other benchmark fractions that can be used sometimes, such as : $\frac{1}{4}$ $\frac{3}{4}$ $1\frac{1}{2}$ 2

Example 1



Identify the benchmark fraction closest to each of the following fractions using the number line :

1 $\frac{3}{8}$

2 $\frac{8}{9}$

3 $\frac{1}{5}$

4 $\frac{8}{6}$

Solution

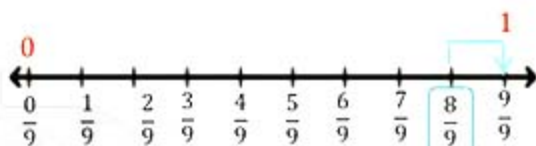


1



The fraction $\frac{3}{8}$ Closer to $\frac{1}{2}$

2



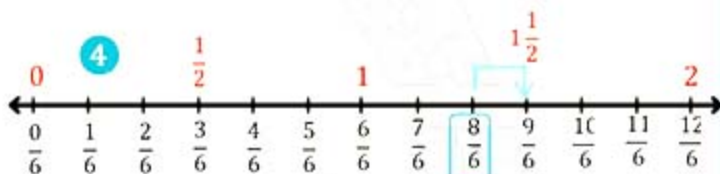
The fraction $\frac{8}{9}$ Closer to 1

3



The fraction $\frac{1}{5}$ Closer to 0

4



The fraction $\frac{8}{6}$ Closer to $1\frac{1}{2}$

Example 2



Determine the appropriate benchmark fraction for each of the following :

1 $1\frac{1}{8}$

2 $1\frac{3}{8}$

3 $1\frac{7}{8}$

Solution



1 The fraction $1\frac{1}{8}$ Closer to the benchmark fraction 1

2 The fraction $1\frac{3}{8}$ Closer to the benchmark fraction $1\frac{1}{2}$

3 The fraction $1\frac{7}{8}$ Closer to the benchmark fraction 2

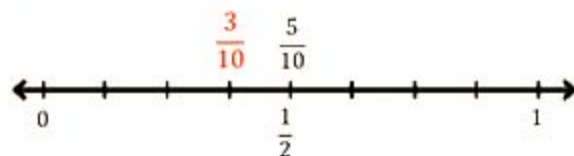
We can compare the two fractions $\frac{5}{8}$ & $\frac{3}{10}$ using benchmark fractions as follows:

1 $\frac{1}{2} < \frac{5}{8}$ Because 5 is greater than half of the denominator 4



2 $\frac{1}{2} > \frac{3}{10}$ Because 3 is smaller than half of the denominator 5

Therefore : $\frac{5}{8} > \frac{3}{10}$



**Example 3**

Compare using benchmark fractions by putting the correct sign ($<$), ($>$), ($=$) :

1 $\frac{3}{6}$ $\frac{2}{5}$

2 $\frac{4}{10}$ $\frac{7}{8}$

3 $\frac{3}{6}$ $\frac{10}{20}$

Solution

1 $\frac{1}{2}$ $\frac{3}{6}$, $\frac{1}{2}$ $\frac{2}{5}$ So : $\frac{3}{6}$ $\frac{2}{5}$

2 $\frac{1}{2}$ $\frac{4}{10}$, $\frac{1}{2}$ $\frac{7}{8}$ So : $\frac{4}{10}$ $\frac{7}{8}$

3 $\frac{1}{2}$ $\frac{10}{20}$, $\frac{1}{2}$ $\frac{3}{6}$ So : $\frac{3}{6}$ $\frac{10}{20}$

Example 4

Arrange the following fractions as required using benchmark fractions:

1 $\frac{3}{6}$, $\frac{6}{8}$, $\frac{2}{10}$ (from least to greatest)

2 $\frac{1}{4}$, $\frac{9}{10}$, $\frac{5}{10}$ (From greatest to least)

Solution

1 $\frac{1}{2} = \frac{3}{6}$, $\left(\frac{4}{8}\right)\frac{1}{2} < \frac{6}{8}$, $\left(\frac{5}{10}\right)\frac{1}{2} > \frac{2}{10}$ So, the order is : $\frac{2}{10}$, $\frac{3}{6}$, $\frac{6}{8}$

2 $\frac{1}{2} = \frac{5}{10}$, $\left(\frac{5}{10}\right)\frac{1}{2} < \frac{9}{10}$, $\left(\frac{2}{4}\right)\frac{1}{2} > \frac{1}{4}$ So, the order is : $\frac{9}{10}$, $\frac{5}{10}$, $\frac{1}{4}$

Try by yourself

Compare using benchmark fractions:

1 $\frac{2}{6}$ $\frac{1}{2}$

2 $\frac{6}{8}$ $\frac{3}{7}$

3 $\frac{7}{14}$ $\frac{1}{2}$

Exercises on Benchmark fractions and applications of benchmark fractions



1 Choose the correct answer from the given options :

1 Which of the following fractions is a benchmark fraction?

(A) $\frac{1}{5}$

(B) $\frac{1}{2}$

(C) $\frac{1}{9}$

(D) $\frac{1}{7}$

2 Which of the following fractions is closer to $\frac{1}{2}$?

(A) $\frac{3}{8}$

(B) $\frac{2}{8}$

(C) $\frac{1}{8}$

(D) $\frac{7}{8}$

3 $\frac{11}{12}$ closer to

(A) 1

(B) $\frac{1}{2}$

(C) $\frac{1}{4}$

(D) 0

4 The fraction $\frac{1}{5}$ closer to

(A) 0

(B) $\frac{1}{2}$

(C) 1

(D) otherwise

5 it is a benchmark fraction closest to $\frac{4}{8}$

(A) $\frac{3}{4}$

(B) $\frac{9}{9}$

(C) $1\frac{1}{2}$

(D) $\frac{1}{2}$

6 The fraction closer to $\frac{5}{9}$ is

(A) 0

(B) $\frac{1}{2}$

(C) 1

(D) 2

7 All of the following fractions are equivalent to the benchmark fraction $\frac{1}{2}$ except

(A) $\frac{2}{4}$

(B) $\frac{5}{10}$

(C) $\frac{2}{8}$

(D) $\frac{3}{6}$

8 The benchmark fraction represented by point E on the following number line

(A) 0

(B) $\frac{1}{2}$

(C) 1

(D) $1\frac{1}{2}$



9 The fraction closer to $\frac{3}{14}$ is.....

(A) 0

(B) $\frac{1}{2}$

(C) 1

(D) $1\frac{1}{2}$

10 The fraction $\frac{14}{15}$ closer to

(A) 0

(B) $\frac{1}{2}$

(C) 1

(D) $1\frac{1}{2}$



2 Compare using benchmark fractions ($<$), ($>$), ($=$)

1 $\frac{3}{4}$ $\frac{3}{8}$

2 $\frac{5}{6}$ $\frac{2}{4}$

3 0 $\frac{2}{3}$

4 $\frac{2}{6}$ $\frac{7}{10}$

5 $\frac{6}{7}$ $\frac{4}{3}$

6 $\frac{6}{8}$ $\frac{3}{12}$

7 $\frac{4}{8}$ $\frac{3}{6}$

8 $\frac{3}{4}$ 1

3 Write the closest benchmark fraction ($2, 1\frac{1}{2}, 1, \frac{1}{2}, 0$) for each of the given fractions:

1 $\frac{4}{6}$ $\rightarrow$

2 $\frac{1}{9}$ $\rightarrow$

3 $\frac{9}{10}$ $\rightarrow$

4 $\frac{7}{12}$ $\rightarrow$

5 $\frac{11}{12}$ $\rightarrow$

6 $\frac{13}{8}$ $\rightarrow$

7 $\frac{3}{2}$ $\rightarrow$

8 $\frac{5}{3}$ $\rightarrow$

3 Use benchmark fractions ($1, \frac{1}{2}, 0$) to arrange the following:

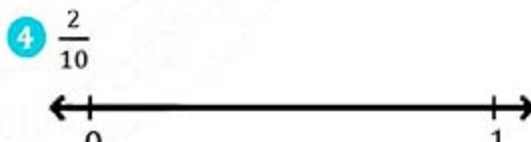
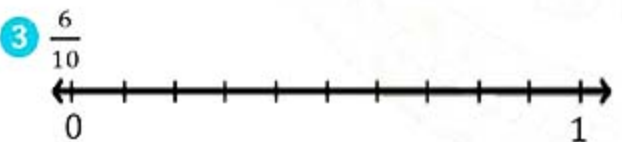
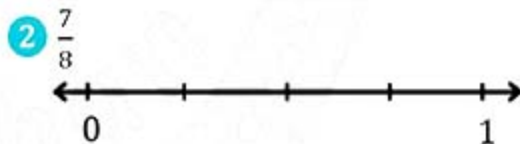
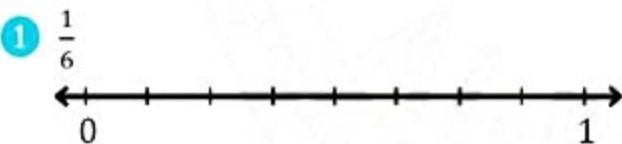
1 $\frac{3}{6}, \frac{6}{8}, \frac{2}{10}$ (ascending order)

2 $\frac{1}{4}, \frac{9}{9}, \frac{5}{9}$ (descending order)

.....

.....

5 Put each proper fraction in its correct position on the number line, then determine whether the fraction is closer to $1, \frac{1}{2}, 0$



6 Read and answer :

1 Rashad and Malik each have a cake of the same size. Rashad ate $\frac{4}{6}$ of his cake, and Malik ate $\frac{4}{8}$ of his cake. Who ate more than $\frac{1}{2}$ of the cake? How did you know?

.....

.....



Equivalent fractions using the Identity element
Equivalent fractions using multiplication and division
Finding the unknown in equivalent fractions

Learn



1 Forming equivalent fractions using the multiplicative identity :



Multiplicative Identity :

- The multiplicative identity is **1**
- When any number is multiplied by the multiplicative identity (**1**) the result is the same number

Example :

$$1 \times \frac{7}{9} = \frac{7}{9}$$

$$\frac{2}{3} \times 1 = \frac{2}{3}$$

$$28 \times 1 = 28$$

- We can write the whole number one as a proper fraction in different ways, as follows:

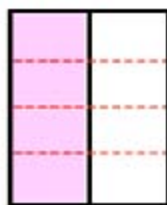
$$1 = \frac{2}{2} = \frac{3}{3} = \frac{4}{4} = \dots$$



Forming Equivalent Fractions Using the Multiplicative Identity

➤ Multiply both numerator and denominator of a fraction by the same number (not zero) to get an equivalent fraction.

Example : Write 3 equivalent fractions for $\frac{1}{2}$:



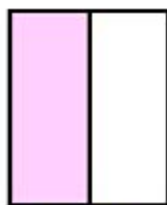
$$\frac{1}{2} \times \frac{2}{2} = \frac{2}{4}$$



$$\frac{1}{2} \times \frac{3}{3} = \frac{3}{6}$$



$$\frac{1}{2} \times \frac{4}{4} = \frac{4}{8}$$



$$\frac{1}{2}$$

$\frac{2}{4}, \frac{3}{6}, \frac{4}{8}$ are equivalent to $\frac{1}{2}$

Example 1

Complete the following to form equivalent fractions:

1 $\frac{2}{5} \times \frac{2}{2} = \frac{\dots}{\dots}$

2 $\frac{3}{4} \times \frac{5}{5} = \frac{\dots}{\dots}$

3 $\frac{4}{6} \times \frac{3}{3} = \frac{\dots}{\dots}$

4 $\frac{1}{3} \times \frac{\dots}{\dots} = \frac{4}{12}$

5 $\frac{5}{8} \times \frac{\dots}{\dots} = \frac{10}{16}$

6 $\frac{2}{6} \times \frac{\dots}{\dots} = \frac{10}{30}$

Solution

1 $\frac{4}{10}$

2 $\frac{15}{20}$

3 $\frac{12}{18}$

4 $\frac{4}{4}$

5 $\frac{2}{2}$

6 $\frac{5}{5}$

Learn

2

Forming equivalent fractions using multiplication and division

Strategy 2 : Using multiplication

➤ We can form fractions equivalent to $(\frac{6}{12})$ Multiply numerator and denominator by the same number **except zero** :

Example:

Multiply numerator and denominator $\times 2$:

$$\frac{6}{12} \times \frac{2}{2} = \frac{12}{24}$$

Multiply numerator and denominator $\times 3$

$$\frac{6}{12} \times \frac{3}{3} = \frac{18}{36}$$

Therefore,: $\frac{6}{12} = \frac{12}{24} = \frac{18}{36}$

Strategy 3 : Using division

- We can form fractions equivalent to $(\frac{6}{18})$ Divide numerator and denominator by the same common factor:

Example:

-divided numerator and denominator $\div 2$:

$$\frac{6 \div 2}{18 \div 2} = \frac{3}{9}$$

-divided numerator and denominator $\div 3$:

$$\frac{6 \div 3}{18 \div 3} = \frac{2}{6}$$

Therefore, $\frac{6}{18} = \frac{3}{9} = \frac{2}{6}$

Example 2



Find an equivalent fraction:

1 $\frac{1}{3}$

2 $\frac{2}{7}$

3 $\frac{10}{25}$

4 $\frac{2}{8}$

Solution



1 $\frac{1 \times 2}{3 \times 2} = \frac{2}{6}$

2 $\frac{2 \times 4}{7 \times 4} = \frac{8}{28}$

3 $\frac{10 \div 5}{25 \div 5} = \frac{2}{5}$

4 $\frac{2 \div 2}{8 \div 2} = \frac{1}{4}$

Notes



To write a fraction in its simplest form, divide the numerator and denominator by their greatest common factor (GCF).

Example $\frac{12 \div 6}{18 \div 6} = \frac{2}{3}$

**Learn****3 Finding the Unknown in Equivalent Fractions**

We can find the unknown value in equivalent fractions as follows

Using multiplication:

Example : Find the unknown : $\frac{2}{5} = \frac{\dots}{15}$

-Determine the number by which the denominator was multiplied(3)

$$\frac{2}{5} = \frac{\dots}{15}$$

× 3

-Multiply the numerator by the same number(3)

$$\frac{2}{5} = \frac{6}{15}$$

× 3

Using division:

Example : Find the unknown : $\frac{25}{35} = \frac{\dots}{7}$

-Determine the number by which the denominator is divided(5)

$$\frac{25}{35} = \frac{\dots}{7}$$

÷ 5

-Divide the numerator by the same number(5)

$$\frac{25}{35} = \frac{5}{7}$$

÷ 5

Example 3

Fill in the missing number in each case to make the fractions equivalent

1 $\frac{5}{6} = \frac{\dots}{30}$

2 $\frac{7}{9} = \frac{14}{\dots}$

3 $\frac{11}{55} = \frac{\dots}{5}$

Solution

1 $\frac{5}{6} = \frac{25}{30}$

× 5

2 $\frac{7}{9} = \frac{14}{18}$

× 2

3 $\frac{11}{55} = \frac{1}{5}$

÷ 11

Example 4

Read and answer :

Malik ate $\frac{2}{3}$ of the chocolate pieces he had. If he had a total of 9 pieces of chocolate .

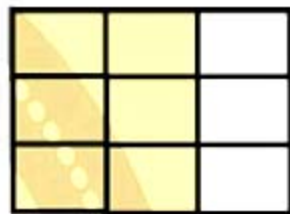
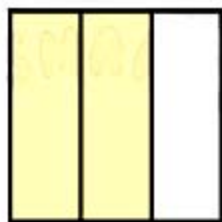
How many pieces did Malik eat? Use the models to show your answer?

Solution

Number of chocolate pieces Malik ate = 6 pieces

$$\frac{2}{3} = \frac{6}{9}$$

$\begin{matrix} \times 3 \\ \uparrow \\ \frac{2}{3} = \frac{6}{9} \\ \downarrow \\ \times 3 \end{matrix}$

**Try by yourself**

Read and answer :

- ① Nabil has 9 cakes $\frac{2}{3}$ of which contain chocolate chips .

How many cakes contain chocolate chips?

.....

.....



1 Choose the correct answer from the given options :

1 = $\frac{4}{7}$

(A) $\frac{5}{8}$ (B) $\frac{3}{6}$ (C) $\frac{8}{14}$ (D) $\frac{11}{14}$

2 $\frac{5}{8} = \frac{\text{.....}}{16}$

(A) 5 (B) 16 (C) 10 (D) 8

3 $\frac{\text{.....}}{3} = \frac{15}{9}$

(A) 6 (B) 5 (C) 3 (D) 1

4 $\frac{2}{3} = \frac{4}{\text{.....}}$

(A) 8 (B) 12 (C) 6 (D) 5

5 If $\frac{6}{9} = \frac{C}{3}$, then C =

(A) 1 (B) 2 (C) 3 (D) 4

6 The number of fifths in one whole is fifths

(A) 4 (B) $\frac{1}{5}$ (C) 3 (D) 5

7 $\frac{2}{9} = \frac{10}{\text{.....}}$

(A) 17 (B) 18 (C) 90 (D) 45

8 $\frac{3}{8} \times \frac{\text{.....}}{\text{.....}} = \frac{3}{8}$

(A) $\frac{3}{8}$ (B) 1 (C) $\frac{1}{8}$ (D) $\frac{2}{8}$

9 The number that makes the two fractions $\frac{15}{\text{.....}}$, $\frac{5}{6}$ equivalent is

(A) 45 (B) 18 (C) 5 (D) 6

10 Which of the following represents the fraction $\frac{6}{18}$ in its simplest form?

(A) $\frac{1}{3}$ (B) $\frac{3}{4}$ (C) $3\frac{1}{3}$ (D) 3

11 Which of the following is equivalent to the fraction $\frac{2}{3}$?

(A) $\frac{3}{3}$ (B) $\frac{4}{6}$ (C) $\frac{3}{4}$ (D) $\frac{1}{2}$

12 $\frac{2}{5} \times \frac{2}{2} = \frac{\text{.....}}{\text{.....}}$

(A) $\frac{4}{8}$ (B) $\frac{2}{10}$ (C) $\frac{4}{7}$ (D) $\frac{4}{10}$

2 Complete :

1 element of additive identity is

2 $\frac{3}{4} \times \frac{5}{5} = \dots\dots\dots$

3 $\frac{2}{3} \times 1 = \dots\dots$

4 $\frac{35}{45} = \frac{7}{\dots\dots\dots}$

5 $\frac{24}{32} = \frac{\dots\dots\dots}{4}$

3 Write the missing number in each of the following so that the two fractions are equivalent :

1 $\frac{4}{7} = \frac{\dots\dots\dots}{21}$

2 $\frac{3}{5} = \frac{15}{\dots\dots\dots}$

3 $\frac{35}{49} = \frac{5}{\dots\dots\dots}$

4 $\frac{20}{25} = \frac{\dots\dots\dots}{5}$

5 $\frac{5}{6} = \frac{15}{\dots\dots\dots}$

6 $\frac{2}{5} = \frac{\dots\dots\dots}{20}$

7 $\frac{3}{4} = \frac{\dots\dots\dots}{12}$

8 $\frac{2}{9} = \frac{10}{\dots\dots\dots}$

9 $\frac{3}{7} = \frac{\dots\dots\dots}{28}$

10 $\frac{6}{18} = \frac{\dots\dots\dots}{6}$

11 $\frac{7}{13} = \frac{21}{\dots\dots\dots}$

4 compare <, >, = :

1 $1 \times \frac{3}{4} \quad \square \quad 1\frac{3}{4}$

2 $3\frac{1}{2} \times 1 \quad \square \quad 5 \times 0$

3 $\frac{3}{3} \times 1 \quad \square \quad \frac{2}{2} \times 2$

4 $4 \times \frac{5}{5} \quad \square \quad 7 \times \frac{4}{4}$

5 $7 \times \frac{7}{7} \quad \square \quad 7 \times \frac{4}{4}$

6 $5 \times \frac{2}{2} \quad \square \quad 3\frac{1}{4} \times 1$

5 complete :

1 $\frac{1}{5} \times \frac{3}{3} = \frac{\dots\dots\dots}{\dots\dots\dots}$

2 $\frac{2}{6} \times \frac{7}{7} = \frac{\dots\dots\dots}{\dots\dots\dots}$

3 $\frac{2}{3} \times \frac{4}{4} = \frac{\dots\dots\dots}{\dots\dots\dots}$

4 $\frac{3}{4} \times \frac{5}{5} = \frac{\dots\dots\dots}{\dots\dots\dots}$

5 $\frac{1}{2} \times \frac{9}{9} = \frac{\dots\dots\dots}{\dots\dots\dots}$

6 $\frac{3}{4} \times \frac{2}{2} = \frac{\dots\dots\dots}{\dots\dots\dots}$

7 $\frac{1}{6} \times \frac{\dots\dots\dots}{\dots\dots\dots} = \frac{3}{18}$

8 $\frac{4}{7} \times \frac{\dots\dots\dots}{\dots\dots\dots} = \frac{16}{28}$

9 $\frac{9}{10} \times \frac{\dots\dots\dots}{\dots\dots\dots} = \frac{45}{50}$

10 $\frac{7}{9} \times \frac{\dots\dots\dots}{\dots\dots\dots} = \frac{28}{36}$

11 $\frac{3}{5} \times \frac{\dots\dots\dots}{\dots\dots\dots} = \frac{18}{30}$



6 complete :

$$1 \quad \frac{2}{6} = \frac{\dots}{\dots}$$

$\times 6$
 $\times 6$

$$2 \quad \frac{1}{9} = \frac{\dots}{\dots}$$

$\times 2$
 $\times 2$

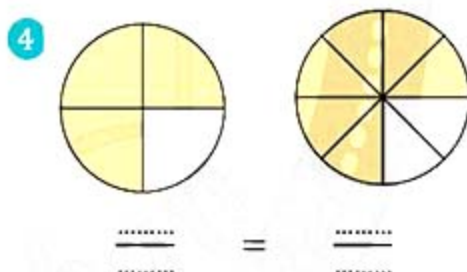
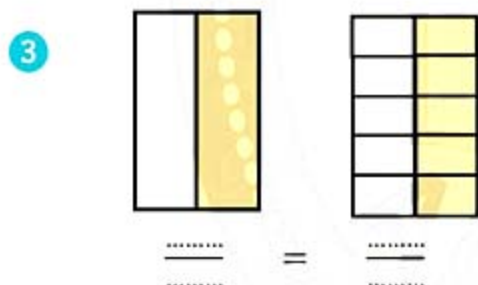
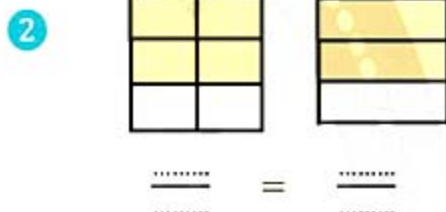
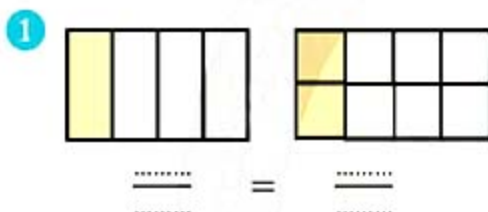
$$3 \quad \frac{3}{18} = \frac{\dots}{\dots}$$

$\times 4$
 $\times 4$

$$4 \quad \frac{5}{8} = \frac{\dots}{\dots}$$

$\div 3$
 $\div 3$

7 Observe each of the following models, then write the equivalent fractions :



8 Read and answer :

Mohamed bought a chocolate bar, divided it into 10 equal parts, and ate 6 parts .

Write the fraction that represents the parts Mohamed ate, then simplify the fraction



Multiplying by a whole number

Learn 1 Different ways to represent a fraction :

We can represent the fraction ($\frac{4}{5}$) in different ways as follows:

Models



Addition sentence

It can be represented as an addition sentence by decomposing it using :unit fractions

$$\frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} = \frac{4}{5}$$

Multiplication sentence

$$4 \times \frac{1}{5} = \frac{4}{5}$$

or

$$\frac{1}{5} \times 4 = \frac{4}{5}$$

Example 1

Express the following fractions using models, an addition sentence, and a multiplication sentence:

1 $\frac{3}{9}$

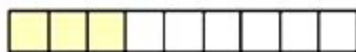
2 $\frac{5}{6}$

3 $\frac{2}{7}$

Solution

1

Bar model :



Addition sentence :

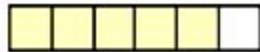
$$\frac{1}{9} + \frac{1}{9} + \frac{1}{9} = \frac{3}{9}$$

Multiplication sentence :

$$\frac{1}{9} \times 3 = \frac{3}{9}$$

2

Bar model:



Addition sentence :

$$\frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} = \frac{5}{6}$$

Multiplication sentence :

$$\frac{1}{6} \times 5 = \frac{5}{6}$$

3

Bar model :



Addition sentence :

$$\frac{1}{7} + \frac{1}{7} = \frac{2}{7}$$

Multiplication sentence :

$$\frac{1}{7} \times 2 = \frac{2}{7}$$

**Learn**

2 Finding the product of a fraction and a whole number in different ways :

The product of $(\frac{1}{4} \times 3)$ The product of:

Using bar model



Using repeated addition

$$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{3}{4}$$

Using multiplication

$$\frac{1}{4} \times 3 = \frac{3}{4}$$

We multiply the whole number by the numerator of the fraction, and keep the denominator as it is.

Example 2

Complete :

1 $\frac{1}{12} \times 9 = \dots\dots$

2 $7 \times \frac{2}{23} = \dots\dots$

3 $\frac{1}{8} \times 4 = \dots\dots$

4 $\frac{2}{7} \times 5 = \dots\dots$

5 $\frac{1}{9} \times \dots\dots = \frac{5}{9}$

6 $3 \times \dots\dots = \frac{6}{11}$

Solution

1 $\frac{9}{12} = \frac{3}{4}$

2 $\frac{14}{23}$

3 $\frac{4}{8} = \frac{1}{2}$

4 $\frac{10}{7}$

5 5

6 $\frac{2}{11}$

Example 3

Read and answer :

Walid drinks $\frac{1}{6}$ Walid drinks .How much juice does he drink in 5 days?

Solution

$$\frac{1}{6} \times 5 = \frac{5}{6}$$

Therefore, the amount of juice that Walid drinks in 5 days = $\frac{5}{6}$ l

Try by yourself

complete :

1 $\frac{1}{8} \times 2 = \dots\dots$

2 $\frac{1}{6} \times 5 = \dots\dots$

3 $\frac{1}{2} \times 0 = \dots\dots$

4 $\frac{1}{7} \times 7 = \dots\dots$

5 $\frac{1}{5} \times 2 = \dots\dots$

6 $\frac{1}{9} \times 8 = \dots\dots$



1 Choose the correct answer from the given options :

1 $\frac{1}{7} + \frac{1}{7} + \frac{1}{7} = \dots\dots\dots$

(A) 1

(B) 7

(C) $\frac{1}{2}$

(D) $\frac{3}{7}$

2 $\frac{1}{7} \times 4 = \dots\dots\dots$

(A) $\frac{4}{7}$

(B) $\frac{28}{35}$

(C) $\frac{7}{4}$

(D) $1\frac{4}{7}$

3 $\frac{2}{7} \times \dots\dots = \frac{6}{7}$

(A) 1

(B) 2

(C) 3

(D) 4

4 $\frac{3}{8} \times \dots\dots = 3$

(A) $\frac{8}{3}$

(B) $\frac{3}{38}$

(C) 8

(D) 3

5 $3 \times \frac{1}{5} = \dots\dots\dots$

(A) $\frac{1}{15}$

(B) $\frac{3}{5}$

(C) $3\frac{1}{5}$

(D) 15

6 $\frac{3}{5} \times 0 = \dots\dots\dots$

(A) $\frac{3}{5}$

(B) 1

(C) $\frac{2}{5}$

(D) 0

7 $\frac{1}{3} \times 2 = \dots\dots\dots$

(A) 2

(B) $\frac{1}{3}$

(C) $\frac{6}{2}$

(D) $\frac{2}{3}$

8 $4 \times \frac{1}{7} = \dots\dots\dots$

(A) $\frac{5}{7}$

(B) $\frac{1}{7}$

(C) $\frac{4}{7}$

(D) 28

9 $\frac{2}{7} \times \dots\dots = \frac{6}{7}$

(A) 3

(B) 5

(C) 8

(D) 2

10 $\frac{1}{8} \times 6 = \dots\dots\dots$

(A) $\frac{7}{8}$

(B) $\frac{3}{4}$

(C) $\frac{6}{48}$

(D) $\frac{3}{8}$

2 complete :

1 $4 \times \frac{1}{2} = \dots\dots$

2 $8 \times \frac{1}{9} = \dots\dots$



3 $5 \times \frac{1}{6} = \dots\dots$

4 $8 \times \frac{1}{4} = \dots\dots$

5 $5 \times \frac{1}{13} = \dots\dots$

6 $2 \times \frac{2}{6} = \dots\dots$

7 $7 \times \frac{1}{8} = \dots\dots$

8 $3 \times \frac{2}{7} = \dots\dots$

9 $8 \times \frac{1}{11} = \dots\dots$

10 $4 \times \frac{1}{9} = \dots\dots$

3 compare $<, >, =$:

1 $\frac{1}{5} \times 3$ $\frac{1}{5} + \frac{1}{5} + \frac{1}{5}$

2 $\frac{1}{7} + \frac{1}{7} + \frac{3}{7}$ $\frac{2}{7} + \frac{4}{7}$

3 $2 \times \frac{3}{4}$ $\frac{3}{4} + \frac{3}{4} + \frac{3}{4}$

4 $6\frac{1}{5}$ $6 \times \frac{1}{5}$

4 Write the fraction that represents the shaded part in each of the following models, then write an addition sentence and a multiplication sentence using unit fractions, as in the example.:

Example :

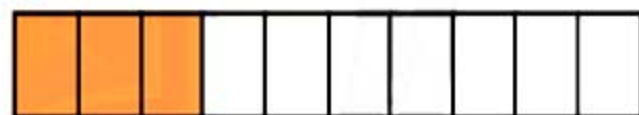


The fraction : $\frac{4}{7}$

Addition sentence : $\frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{1}{7} = \frac{4}{7}$

Multiplication sentence : $\frac{1}{7} \times 4 = \frac{4}{7}$

1



The fraction

Addition sentence :

Multiplication sentence

Unit 10

Decimal Fractions



Lessons

1

- ✓ Exploring Decimals
- ✓ Hundredths

2

- ✓ Place Value
- ✓ Different Forms of Decimals

3

- ✓ Same Value in Different Forms
- ✓ Parts of a Whole

4

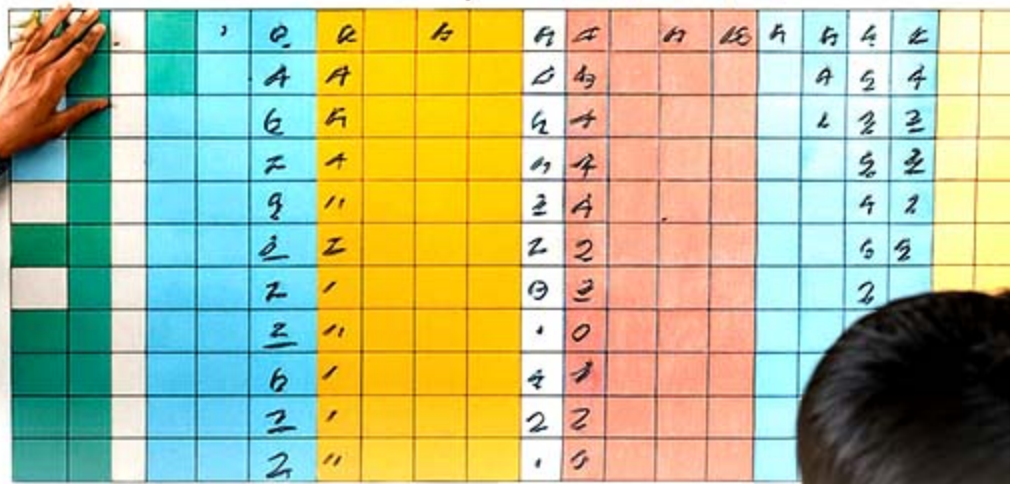
- ✓ Equivalent Forms of Fractions

5

- ✓ Comparing Decimals
- ✓ Comparing Fractions and Decimals

6

- ✓ Adding two fractions with denominators of 10 or 100 using models
- ✓ Adding two fractions with denominators of 10 or 100 by converting to equivalent fractions



Exploring Decimal Fractions and Hundredths

Learn



1 Exploring Decimal Fractions

Parts out of ten:

Each of the following models is divided into 10 equal parts. Observe the fraction and decimal that represent the shaded part in the following shapes:

The model	The fraction	The decimal
	$\frac{1}{10}$	0.1 Read as: one tenth. → Decimal point
	$\frac{6}{10}$	0.6 Read as: six tenths.
	$\frac{10}{10}$	1.0 one whole = ten tenths.

Try by yourself

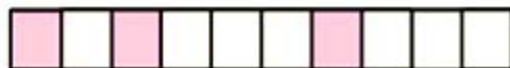


Choose the correct answer:

The decimal fraction represented by the shaded part in the following model is ...

A 0.3

B 0.7

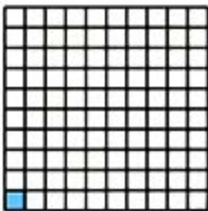
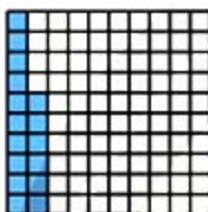
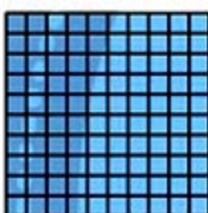


C 1.7

D 1.34

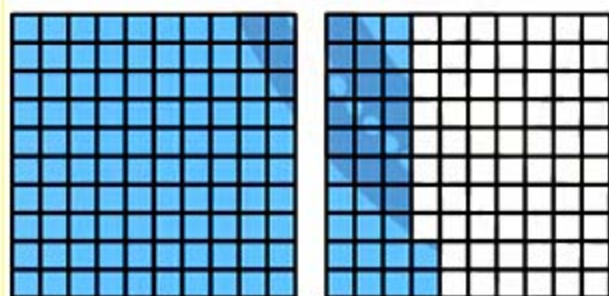
Parts out of one hundred:

Each of the following models is divided into 100 equal parts. Observe the fraction and the decimal that represent the shaded part in the following shapes:

The model	The fraction	The decimal
	$\frac{1}{100}$	0.01 Read as: One-hundredth → Decimal point
	$\frac{16}{100}$	0.16 Read as: Sixteen-hundredths
	$\frac{100}{100}$	1.00 One whole = 100 hundredths

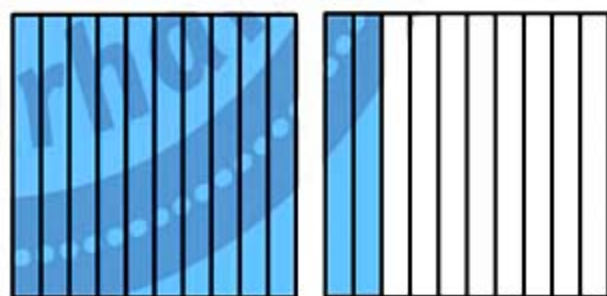
The decimal number:

A decimal number consists of a whole number to the left of the decimal point, and a decimal fraction to the right. For example:



Whole number **1.32** Decimal fraction
 ↓
 Decimal point

Read as: One and thirty-two hundredths



Whole number **1.2** Decimal fraction
 ↓
 Decimal point

Read as: One and two-tenths

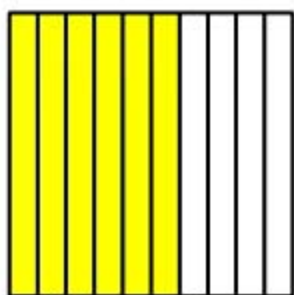


Example 1

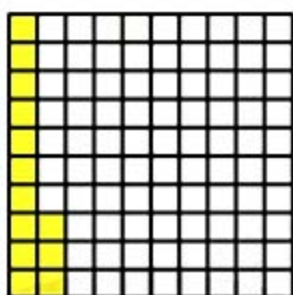


Write the fraction and decimal that represent the following models:

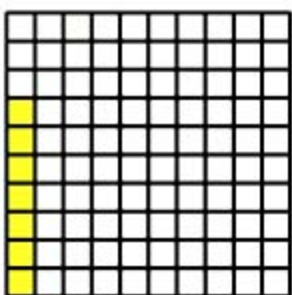
1



2



3



Solution



1 $\frac{6}{10} = 0.6$

2 $\frac{13}{100} = 0.13$

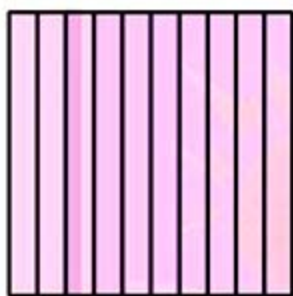
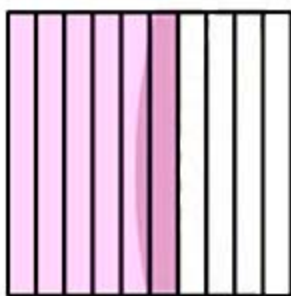
3 $\frac{7}{100} = 0.07$

Example 2

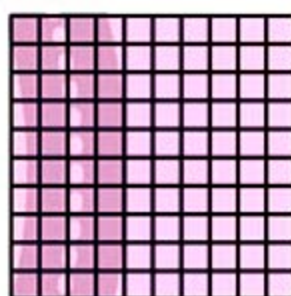
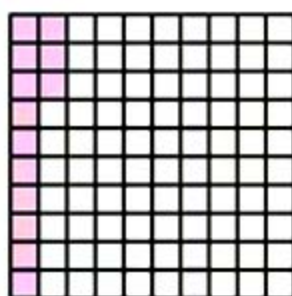


Write the decimal number that represents the shaded part in the following models:

1



2



Solution



1 1.6

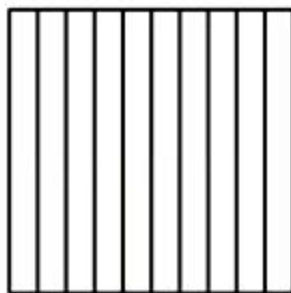
2 1.13

Example 3

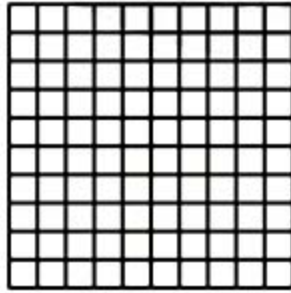


Shade each of the following models to represent the given fraction or decimal:

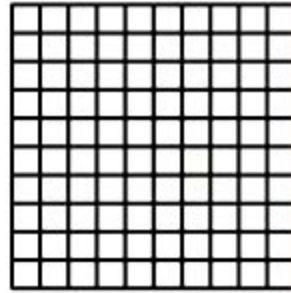
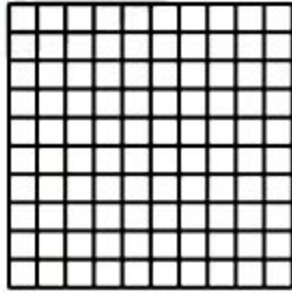
1 0.5



2 0.81



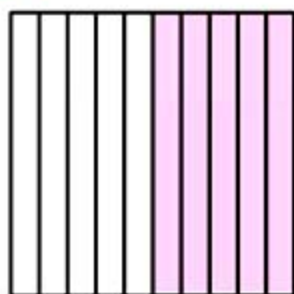
3 1.07



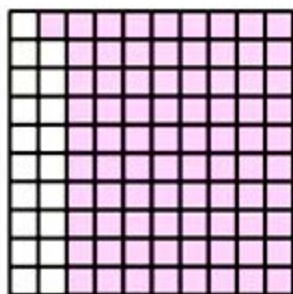
Solution



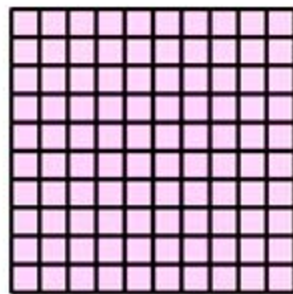
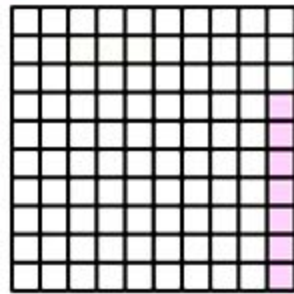
1 0.5



2 0.81



3 1.07



Example 4



Write the decimal fraction and the common fraction that represent the shaded parts in each of the following models using the number line:

1



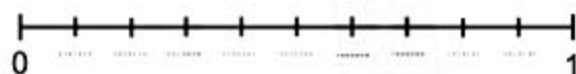
...



2



...

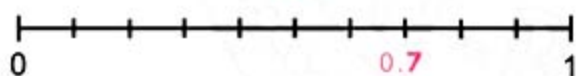


Solution



1

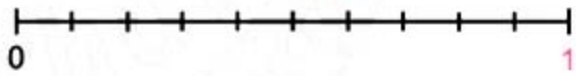


$$\frac{7}{10}$$


$$\frac{7}{10} = 0.7$$

2



$$\frac{10}{10}$$


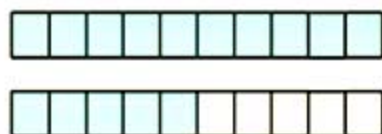
$$\frac{10}{10} = 1$$

Try by yourself



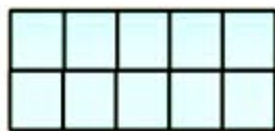
Circle the number that represents each of the following models:

1



(0.5, 15, 1.5)

2



(0.1, 1.0, 0.01)

3



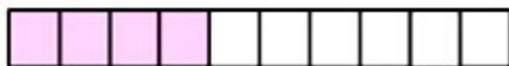
(3.1, 0.3, 1.3)



1 Choose the correct answer from the given options :

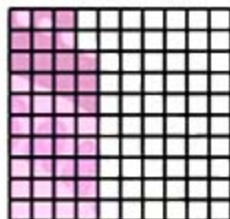
1 The decimal fraction represented by the shaded part in the following model is ...

- (A) 0.4 (B) 0.6
(C) 0.5 (D) 0.04



2 The decimal fraction that represents the shaded part in the following model is ...

- (A) 3.8 (B) 8.3
(C) 0.83 (D) 0.38



3 The decimal number represented by the shaded part in the following model is ...

- (A) 6.1 (B) 1.6
(C) 10.6 (D) 6.10

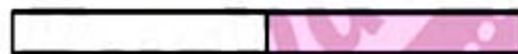


4 $0.3 = \dots\dots\dots$

- (A) $\frac{3}{10}$ (B) $\frac{50}{10}$ (C) $\frac{2}{5}$ (D) $\frac{5}{2}$

5 The decimal fraction that represents the given model is

- (A) 0.1 (B) 0.2
(C) 0.5 (D) $\frac{1}{2}$



2 Complete the following:

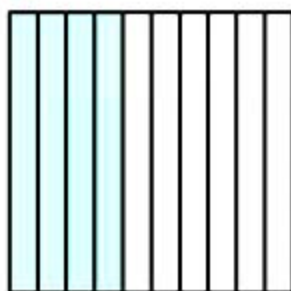
1 The fraction that represents 0.39 is

2 $\frac{81}{100} = \dots\dots\dots$ (In decimal form)

3 $\frac{6}{10} = \dots\dots\dots$ (In decimal form)

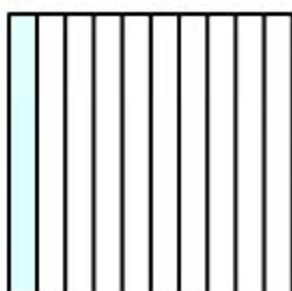
3 Write the decimal that represents the shaded parts in each model:

1



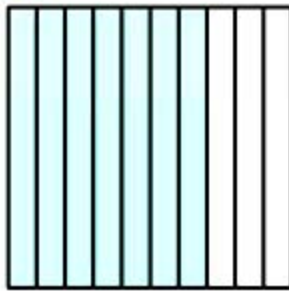
.....

2



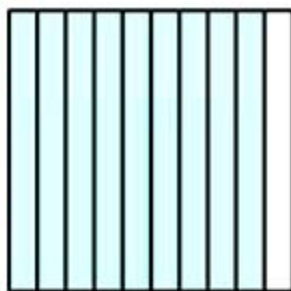
.....

3



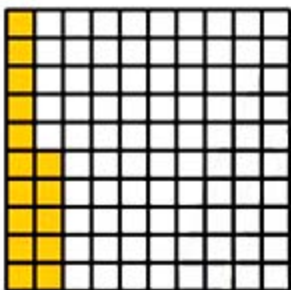
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4



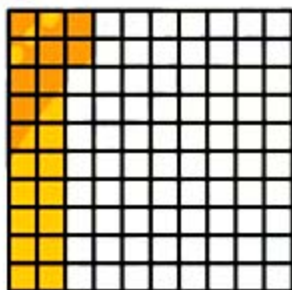
.....

5



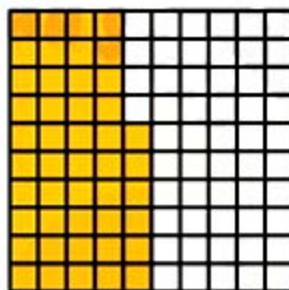
.....

6



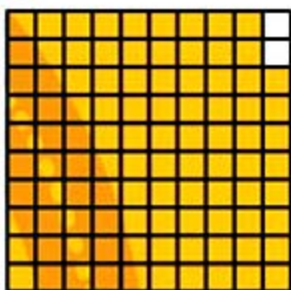
.....

7



.....

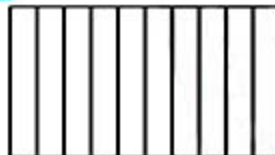
8



.....

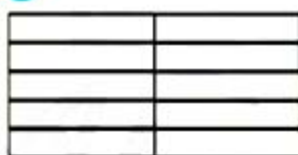
4 Shade each model according to the given fraction or decimal number:

1



0.8

2



0.7

3



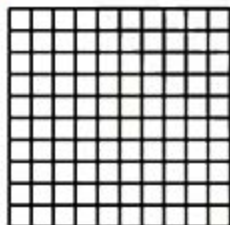
0.5

4



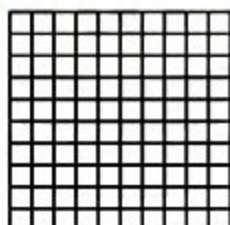
0.9

5



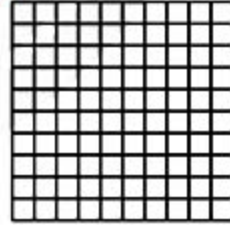
0.40

6



0.72

7



0.06

5 Write each of the following as a decimal:

1

$$\frac{3}{10} = \dots\dots\dots$$

2

$$\frac{7}{10} = \dots\dots\dots$$

3

$$\frac{5}{10} = \dots\dots\dots$$

4

$$\frac{18}{10} = \dots\dots\dots$$

5

$$3\frac{4}{10} = \dots\dots\dots$$

6

$$\frac{99}{10} = \dots\dots\dots$$

7

$$\frac{10}{10} = \dots\dots\dots$$

8

$$\frac{7}{100} = \dots\dots\dots$$



9 $\frac{19}{100} = \dots\dots\dots$ 10 $\frac{73}{100} = \dots\dots\dots$ 11 $3\frac{5}{100} = \dots\dots\dots$ 12 $\frac{215}{100} = \dots\dots\dots$

6 Write the following as a common fraction or a mixed number, if possible:

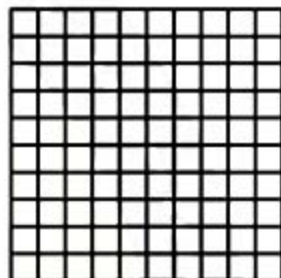
1 $0.8 = \dots\dots\dots$ 2 $1.6 = \dots\dots\dots$ 3 $0.01 = \dots\dots\dots$ 4 $0.11 = \dots\dots\dots$
 5 $0.3 = \dots\dots\dots$ 6 $0.33 = \dots\dots\dots$ 7 $0.7 = \dots\dots\dots$ 8 $0.09 = \dots\dots\dots$

7 Answer the following:

Basem has a quilt his mother bought; 0.35 of it is blue,
 0.4 is red, and the rest is yellow.

Color the quilt to represent the above decimals.

What decimal fraction represents the yellow part of Basem's quilt?



Decoding Decimals!

Exploring "Tenths"

When one whole is divided into 10 equal parts, each part is called a "tenth".



One whole divided into 10 equal parts = tenths

$\frac{6}{10}$ is the same as 0.6

6 out of 10 parts



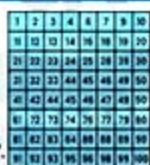
$\frac{6}{10}$

Six parts out of ten can be written as the fraction $\frac{6}{10}$ or the decimal 0.6.

= 0.6

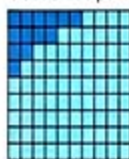
Exploring "Hundredths"

When one whole is divided into 100 equal parts, each part is called a "hundredth".



$\frac{13}{100}$ is the same as 0.13

13 out of 100 parts



$\frac{13}{100}$

Thirteen parts out of one hundred can be written as the fraction $\frac{13}{100}$ or the decimal 0.13.

= 0.13

Anatomy of a Decimal Number

DECIMAL POINT

WHOLE
NUMBER
(on the left)

FRACTIONAL
PART
(on the right)

DECIMAL POINT

Example: 1.6



This means 1 whole unit and 6 extra tenths. It is read as "one and six-tenths".



Place Value and Different Forms of Decimal Fractions

Learn



1 Reading decimal numbers:

Decimals can be read using the place-value table as follows:

Ones	Decimal point	Tenths	Hundredths
	.		
3	.	6	2
5	.	0	7
8	.	5	0

It is read as: three and sixty-two hundredths.

It is read as: five and seven hundredths.

It is read as: eight and fifty-eight hundredths.

Or: eight and five tenths.



Note that:

Numbers are read from left to right; that is, we start with the whole number and then the decimal part.



Learn



Place value and the value of a digit in a decimal number:

The place value and digit value in 5.37 can be identified as follows:

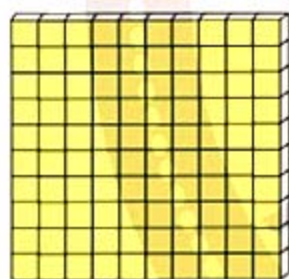
Place Value	Ones	Decimal Point	Tenths	Hundredths
	↑	↑	↑	↑
Number	5	.	3	7
	↓		↓	↓
Digit Value	5		0.3 $(\frac{3}{10})$	0.07 $(\frac{7}{100})$

Note that:

➤ The digit that represents the tenths place is the **first digit** to the right of the decimal point.

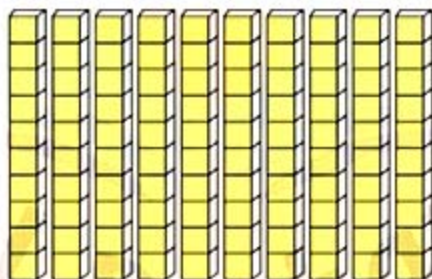
➤ The digit that represents the hundredths place is the **second digit** to the right of the decimal point.

Note that:



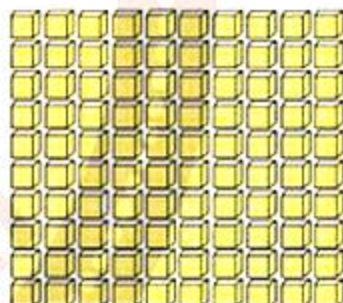
One whole

=

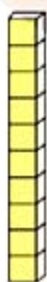


10 tenths

=



100 hundredths



1 tenth

=



10 hundredths

Example 1

Write the place value and the value of the underlined digit in each number:

1 7.38

2 5.91

3 4.37

4 14.08

Solution

- 1 Place: tenths.
Digit value: 0.3

- 2 Place: hundredths.
Digit value: 0.01

- 3 Place: units.
Digit value: 4

- 4 Place: tenths.
Digit value: 0

Example 2

Use 253.49 to answer the following:

- What is the value of the digit 3?
- Which digit is in the hundredths place?
- What is the value of the digit in the tenths place?
- What is the numerical value of the digit in the hundreds place?

Solution

1 3

2 9

3 0.4

4 200

Example 3

Write three different values of the digit 9 in 9.99 and identify the smallest.

Solution

- The value of the digit 9 in the hundredths place is 0.09
- The value of the digit 9 in the tenths place is 0.9
- The value of the digit 9 in the ones place is 9
- The smallest value of the digit 9 is: 0.09

Try by yourself

Use 45.17 to answer:

- What is the value of 7?
- Which digit is in the tens place?
- What is the value of 1?
- Which digit is in the tenths place?
- What is the value of 5?
- Which digit is in the hundredths place?



Example 4



Read, then write the decimal fraction or decimal number:

- 1 Six parts of ten are written as:
- 2 Five and four hundredths are written as:
- 3 Sixty-seven hundredths are written as:
- 4 Eight and nine-tenths are written as:

Solution

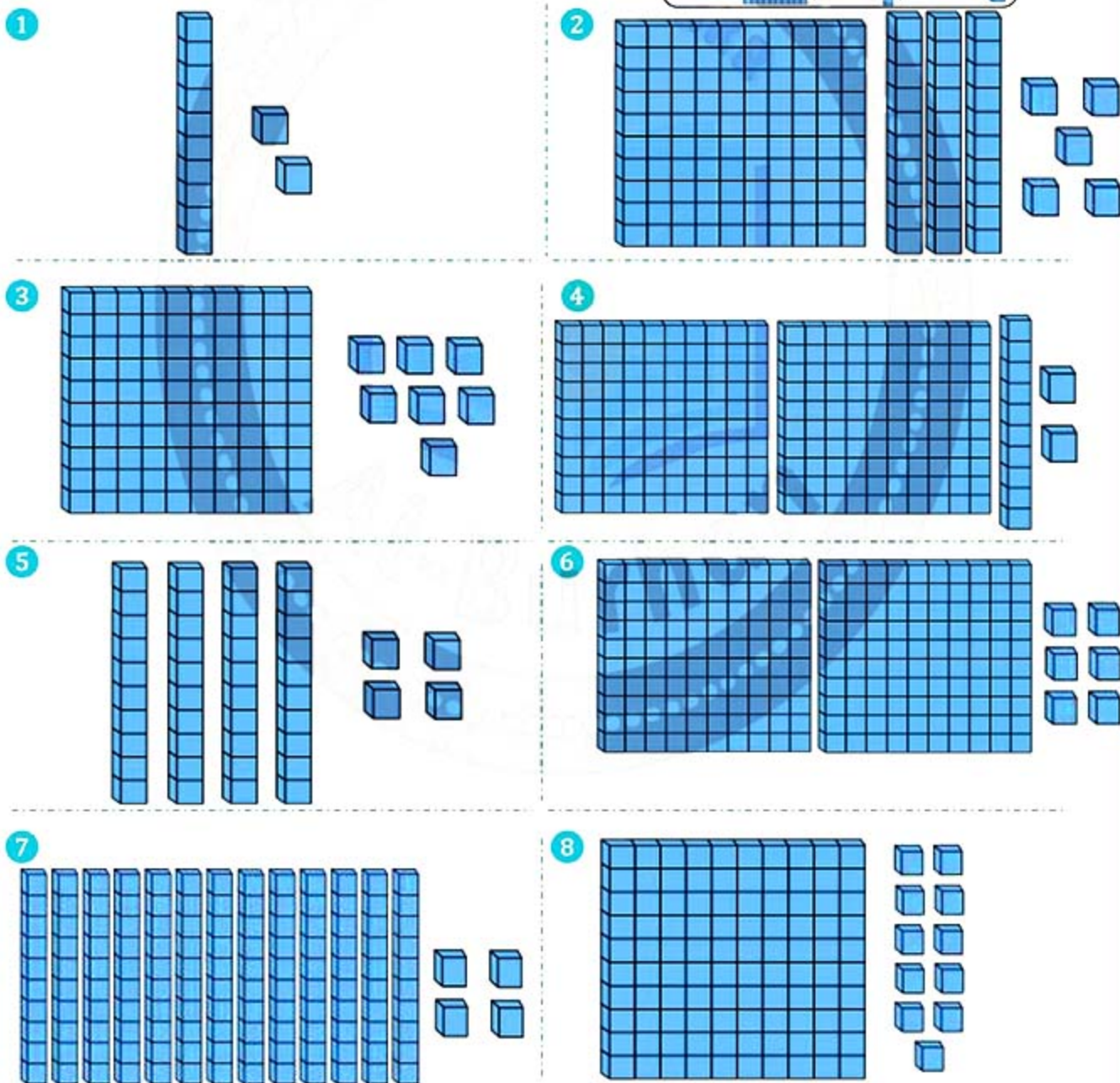
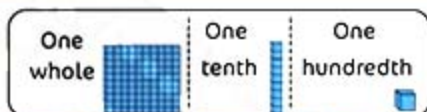


- 1 0.6
- 2 5.04
- 3 0.67
- 4 8.9

Example 5



Write the decimal number represented by each of the following models:



Solution

1 0.12

2 1.35

3 1.07

4 2.12

5 0.44

6 2.06

7 1.34

8 1.11

Learn



3 Forms of decimal fractions:

Standard
formIt is writing the number in
digits as follows: **2.47**Word
formIt is writing the number in
words as follows:**Two and forty-seven hundredths**Expanded
formIt is writing the number as the sum of
the values of its digits as follows: **$0.07 + 0.4 + 2$** Unit
formIt is writing the number with
mentioning the place value of each
digit as follows:**2 ones, 4 tenths, and 7 hundredths**

The decimal
number **2.47** can
be written in
different forms
as follows:

The model that represents the number **2.47**

Ones	.	Tenths	Hundredths

Example 6



Write the following numbers in standard form:

1 Six and thirty-five hundredths $\Rightarrow$ 2 $0.09 + 0.4 + 1 \Rightarrow$ 3 3 units and 7 tenths $\Rightarrow$ 4 $0.08 + 2 \Rightarrow$ 5 Fifty-four and eighty-six hundredths $\Rightarrow$ 6 $0.07 + 0.1 \Rightarrow$

**Solution**

1 6.35

2 1.49

3 3.7

4 2.08

5 54.86

6 0.17

Example 7

Complete by writing each decimal in the required form:

1 $1.5 \Rightarrow$

(word form)

2 $3.8 \Rightarrow$

(Expanded Form)

3 $6.23 \Rightarrow$

(Unit Form)

Solution

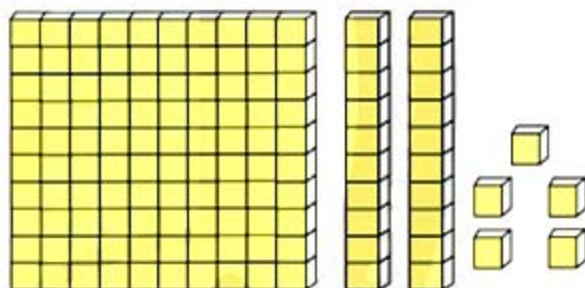
1 one and five-tenths

2 $0.08 + 3$

3 6 ones, 2 tenths, and 3 hundredths

Example 8

Observe the adjacent model,
then write the decimal it represents
in the following forms: (standard form,
verbal form, expanded form, units form)

**Solution**

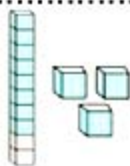
- Standard form: **1.25**
- Verbal form: **One and twenty-five hundredths**
- Expanded form: **$0.05 + 0.2 + 1$**
- Units form: **1 unit, 2 tenths, and 5 hundredths**

Exercises on Place Value and Different Forms of Decimal Fractions



1 Choose the correct answer from the given options :

- 1 The standard form of 3 units and 2 tenths is
 (A) 0.3 (B) 3.2 (C) 2.3 (D) 0.32
- 2 $1 + 0.7 + 0.03 =$
 (A) 1.73 (B) 1.37 (C) 0.71 (D) 10.17
- 3 The standard form of 3 tens, 5 units, 6 tenths, and 2 hundredths is
 (A) 235.6 (B) 305.62 (C) 35.62 (D) 356.2
- 4 The verbal form of the decimal 0.6 is
 (A) sixty (B) six-tenths (C) six (D) six-hundredths
- 5 The standard form of 2 units and 9 hundredths is
 (A) 9.2 (B) 2.9 (C) 2.09 (D) 92
- 6 $4.15 = 4 + 0.1 +$
 (A) 50 (B) 5 (C) 0.05 (D) 0.5
- 7 The standard form of "fifty-seven hundredths" is
 (A) 0.57 (B) 57 (C) 570 (D) 5.7
- 8 The place value of the digit 3 in 2.34 is
 (A) Units (B) Tens (C) Tenth (D) Hundredth
- 9 The value of the digit 6 in 5.06 is
 (A) 0.06 (B) 6 (C) 60 (D) 0.6
- 10 Which digit occupies the tenths place in 137.85?
 (A) 3 (B) 5 (C) 8 (D) 6
- 11 The digit in the hundredths place of 137.52 is
 (A) 5 (B) 3 (C) 2 (D) 7
- 12 The value of digit 7 in 5.76 equals
 (A) 0.07 (B) 0.7 (C) 7 (D) 70
- 13 The decimal representing the model shown is
 (A) 1.3 (B) 0.3
 (C) 0.13 (D) 0.12
- 14 The value of digit 6 in 762.15 equals
 (A) 0.6 (B) 0.06 (C) 6 (D) 60





15 Which of the following represents five hundredths?

- (A) 0.5 (B) 0.05 (C) 0.005 (D) 5

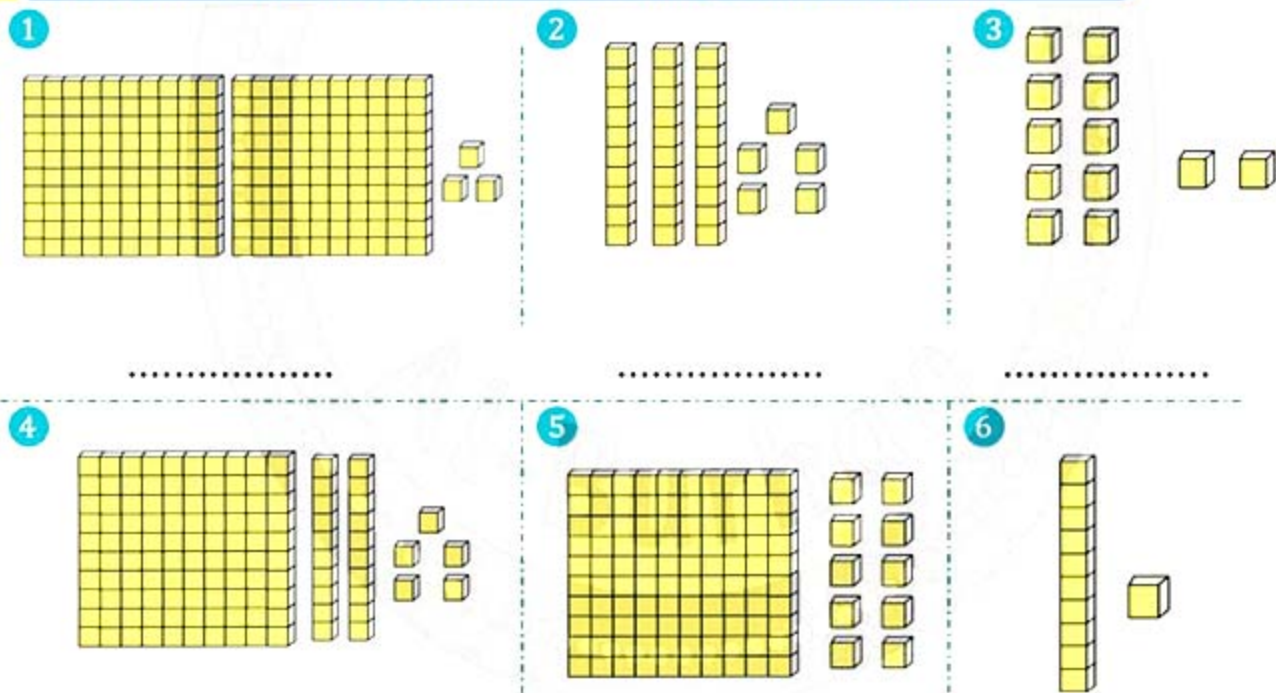
16 The decimal whose digit 8 has the value 0.08 is

- (A) 81.50 (B) 1.08 (C) 11.80 (D) 8.5

2 Complete the following:

- 1 $4.67 = 4 + 0.6 + \dots\dots\dots$
- 2 The standard form of nine and forty-three hundredths is
- 3 $1 + 0.2 + 0.05 = \dots\dots\dots$
- 4 The verbal form of 24.13 is
- 5 $\dots\dots\dots + \dots\dots\dots + \dots\dots\dots = 9.25$ (in expanded form)
- 6 The place value of digit 2 in 2.05 is
- 7 The value of digit 1 in 3.21 is
- 8 The digit in the tenths place of 7.53 is

3 Write the decimal that represents the shaded parts in each model:



4 Observe the decimal in each of the following then complete:

- 1 **5.34**
 - > The digit in the tenths place is
 - > The place value of the digit **5** is
 - > The digit in the hundredths place is
 - > The value of the digit **4** is

2 2.78

- The place value of digit 7 is
- The value of digit 7 is
- The digit in the hundredths place is
- The value of digit 8 is

5 Write the place value and the value of the highlighted digit as in the example:

Example: 5.72 ➤ Place value: Tenths ➤ Value: 0.7

- | | | |
|---------|----------------------|----------------|
| 1 4.05 | ➤ Place value: | ➤ Value: |
| 2 27.88 | ➤ Place value: | ➤ Value: |
| 3 3.21 | ➤ Place value: | ➤ Value: |
| 4 0.95 | ➤ Place value: | ➤ Value: |
| 5 17.89 | ➤ Place value: | ➤ Value: |
| 6 102.3 | ➤ Place value: | ➤ Value: |
| 7 7.29 | ➤ Place value: | ➤ Value: |
| 8 12.41 | ➤ Place value: | ➤ Value: |

6 Write each of the following numbers in (standard form):

- 1 Five hundredths
- 2 One and thirty-four hundredths
- 3 One hundred forty-one and six tenths
- 4 4 tens, 5 ones, and 6 hundredths

7 Write the following numbers in (expanded form):

- 1 2.04
- 2 62.52
- 3 5 ones, 6 tenths and 8 hundredths
- 4 7 ones and 9 hundredths
- 5 Fifty-two hundredths
- 6 Twenty and five tenths
- 7 Nine and forty-three hundredths
- 8 9 tens and 9 tenths



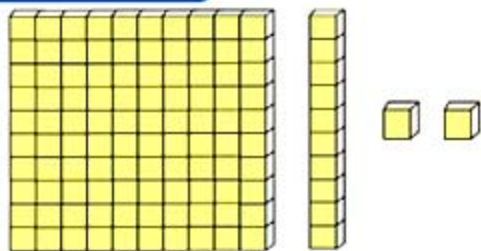
8 Express the given models using the different forms:

1 ➤ Standard Form:

➤ Word Form:

➤ Unit Form:

➤ Expanded Form:

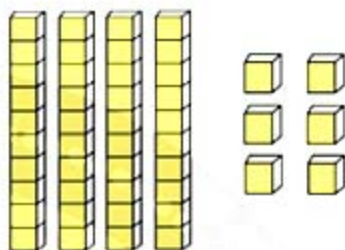


2 ➤ Standard Form:

➤ Word Form:

➤ Unit Form:

➤ Expanded Form:

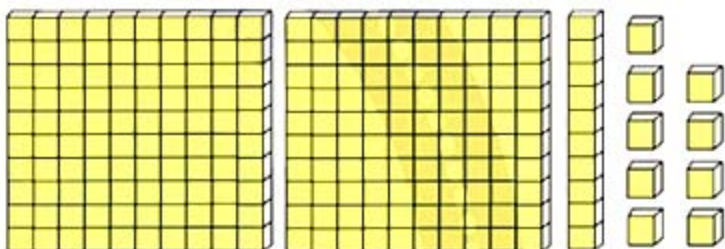


3 ➤ Standard Form:

➤ Word Form:

➤ Unit Form:

➤ Expanded Form:

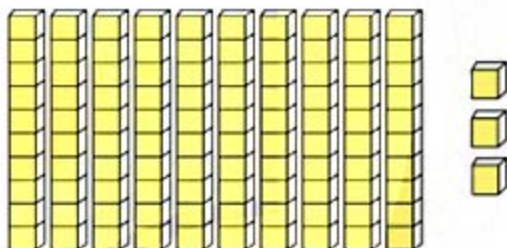


4 ➤ Standard Form:

➤ Word Form:

➤ Unit Form:

➤ Expanded Form:

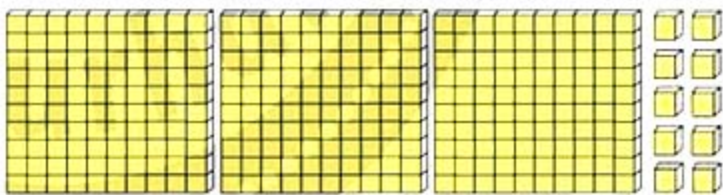


5 ➤ Standard Form:

➤ Word Form:

➤ Unit Form:

➤ Expanded Form:



9 Answer the following:

1 Write the word form of the decimal number 35.9

2 Write the decimal number 74.26 in the required forms:

Expanded form:

Units form:



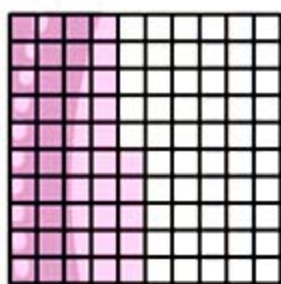
Same Value in Different Forms and Parts of a Whole

Learn



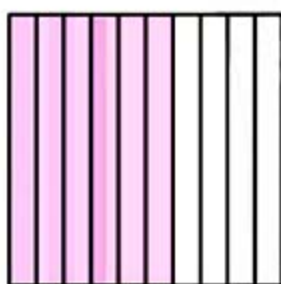
1 Same Value in Different Forms

The following two models can be expressed using fractions and decimals as follows:



Fraction form: $\frac{45}{100}$

Decimal form: 0.45



Fraction form: $\frac{6}{10}$

Decimal form: 0.6



First: Converting decimal fractions into fractional form:

► When there is one digit to the right of the decimal point, we use **10** in the denominator.

$$\frac{6}{10} = 0.6 \text{ (It is read as: six tenths)}$$

$$\frac{4}{10} = 0.4 \text{ (It is read as: four tenths)}$$

One digit to the right of the decimal

► When there are two digits to the right of the decimal point, we use **100** in the denominator.

$$\frac{57}{100} = 0.57 \text{ (It is read as: fifty-seven hundredths)}$$

$$\frac{2}{100} = 0.02 \text{ (It is read as: two hundredths)}$$

Two digits to the right of the decimal



Second: Converting decimal numbers into mixed numbers or improper fractions:

The decimal number 1.2 can be written as a mixed number as follows:

We write the number to the left of the decimal point (the whole number) as it is.
We use 10 in the denominator because there is one digit to the right of the decimal point.

$$1.2 = 1 \frac{2}{10}$$

It is read: One and two tenths

The decimal number 1.2 can be written as an improper fraction as follows:

We write the number without the decimal point in the numerator. We use 10 in the denominator because there is one digit to the right of the decimal point.

$$1.2 = \frac{12}{10}$$

It is read: Twelve tenths

Example 1



Express each of the following models as a fraction and a decimal:

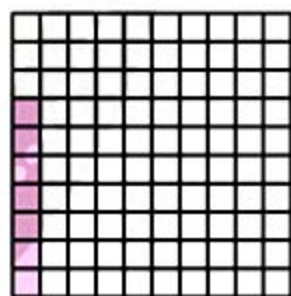
1



2



3



Solution

1 $0.9 = \frac{9}{10}$

2 $0.2 = \frac{2}{10}$

3 $0.07 = \frac{7}{100}$

Example 2



Express the following decimals as fractions or mixed numbers:

1 0.4

2 0.75

3 5.03

4 2.7

Solution

1 $\frac{4}{10}$

2 $\frac{75}{100}$

3 $5 \frac{3}{100}$

4 $2 \frac{7}{10}$

Example 3

Express the following fractions and mixed numbers as decimals:

1 $\frac{13}{100}$

2 $\frac{8}{10}$

3 $\frac{24}{100}$

4 $5\frac{36}{100}$

5 $4\frac{7}{10}$

6 $9\frac{6}{100}$

Solution

1 0.13

2 0.8

3 0.24

4 5.36

5 4.7

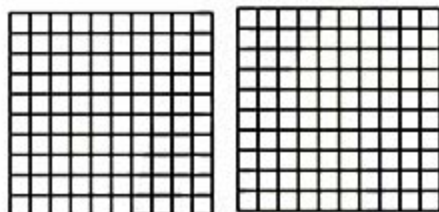
6 9.06

Example 4

Write the decimal number that represents the shaded part in the models:

1

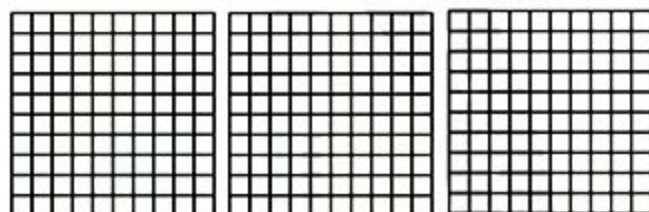
1.36



Mixed number:

2

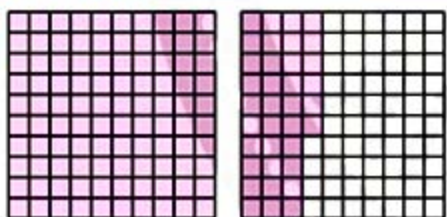
2.47



Mixed number:

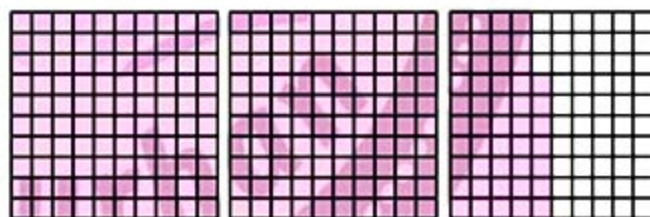
Solution

1



Mixed number: $1\frac{36}{100}$

2



Mixed number: $2\frac{47}{100}$



Learn 2 Decomposing Units into Tenths, Hundredths, and Common Fractions

1

1 = 10 tenths

1 = hundredths 100

1 as a fraction is $\frac{10}{10}$ or $\frac{100}{100}$

3

3 = 30 tenths

3 = 300 hundredths

3 as a fraction is $\frac{30}{10}$ or $\frac{300}{100}$

2.4

2.4 = 4 tenths + 20 tenths = 24 tenths

2.4 = 40 hundredths + 200 hundredths = 240 hundredths

2.4 as a fraction is $\frac{24}{10}$ or $\frac{240}{100}$

10.6

10.6 = 6 tenths + 100 tenths = 106 tenths

10.6 = 60 hundredths + 1,000 hundredths = 1,060 hundredths

10.6 as a fraction is $\frac{106}{10}$ or $\frac{1,060}{100}$

Example 5

Complete the following:

- 1 Number of tenths in one whole =
- 2 Number of tenths in 4 =
- 3 Number of hundredths in 2.25 =
- 4 Number of tenths in 7.4 =

Solution

- 1 10 tenths
- 2 40 tenths
- 3 225 tenths
- 4 74 tenths

Example 6

Break down the following to express each number as tenths, then write it in fractional form:

- 1 5
- 2 6.3
- 3 2.1

Solution

- 1 > tenths: 50 > Fraction form: $\frac{50}{10}$
- 2 > tenths: 63 > Fraction form: $\frac{63}{10}$
- 3 > tenths: 21 > Fraction form: $\frac{21}{10}$

Try by yourself



Complete the following:

1 $4 = \frac{\quad}{10} = \frac{\quad}{100}$

2 $2.3 = \frac{\quad}{10} = \frac{\quad}{100}$



From Decimals to Fractions

Decimals and fractions are two ways to write the same value.

One Decimal Place = Tenths

ONE DECIMAL PLACE

$$0.6 = \frac{6}{10}$$



A number with one digit after the decimal point can be written as a fraction with a denominator of 10.

What is a "Tenth"?

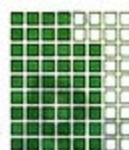
$$1 = \frac{10}{10}$$



Two Decimal Places = Hundredths

TWO DECIMAL PLACES

$$0.75 = \frac{75}{100}$$



A number with two digits after the decimal point uses a denominator of 100.

What is a "Hundredth"?

$$1 = \frac{100}{100}$$



Handling Whole Numbers

WHOLE NUMBERS STAY

$$2.7 = 2 \text{ and } \frac{7}{10}$$



For numbers greater than 1, the whole number stays the same, and the decimal becomes a fraction.

Exercises on Same Value in Different Forms and Parts of a Whole



1 Choose the correct answer from the given options:

- 1 The decimal fraction 0.59 as a common fraction =

(A) $\frac{59}{10}$
(B) $5\frac{9}{10}$
(C) $\frac{59}{100}$
(D) $9\frac{5}{10}$
- 2 73 hundredths =

(A) 7.3
(B) 0.37
(C) 3.7
(D) 0.73
- 3 5.5 = tenths

(A) 0.55
(B) 5.5
(C) 55
(D) 550
- 4 Number of hundredths in 2 =

(A) 2
(B) 200
(C) 20
(D) 2000
- 5 $\frac{346}{100}$ = (as a decimal)

(A) 3.46
(B) 34.6
(C) 0.346
(D) 346
- 6 The decimal number 2.74 as a fraction =

(A) $\frac{274}{100}$
(B) $\frac{274}{10}$
(C) $\frac{247}{100}$
(D) $\frac{74}{100}$
- 7 473 hundredths =

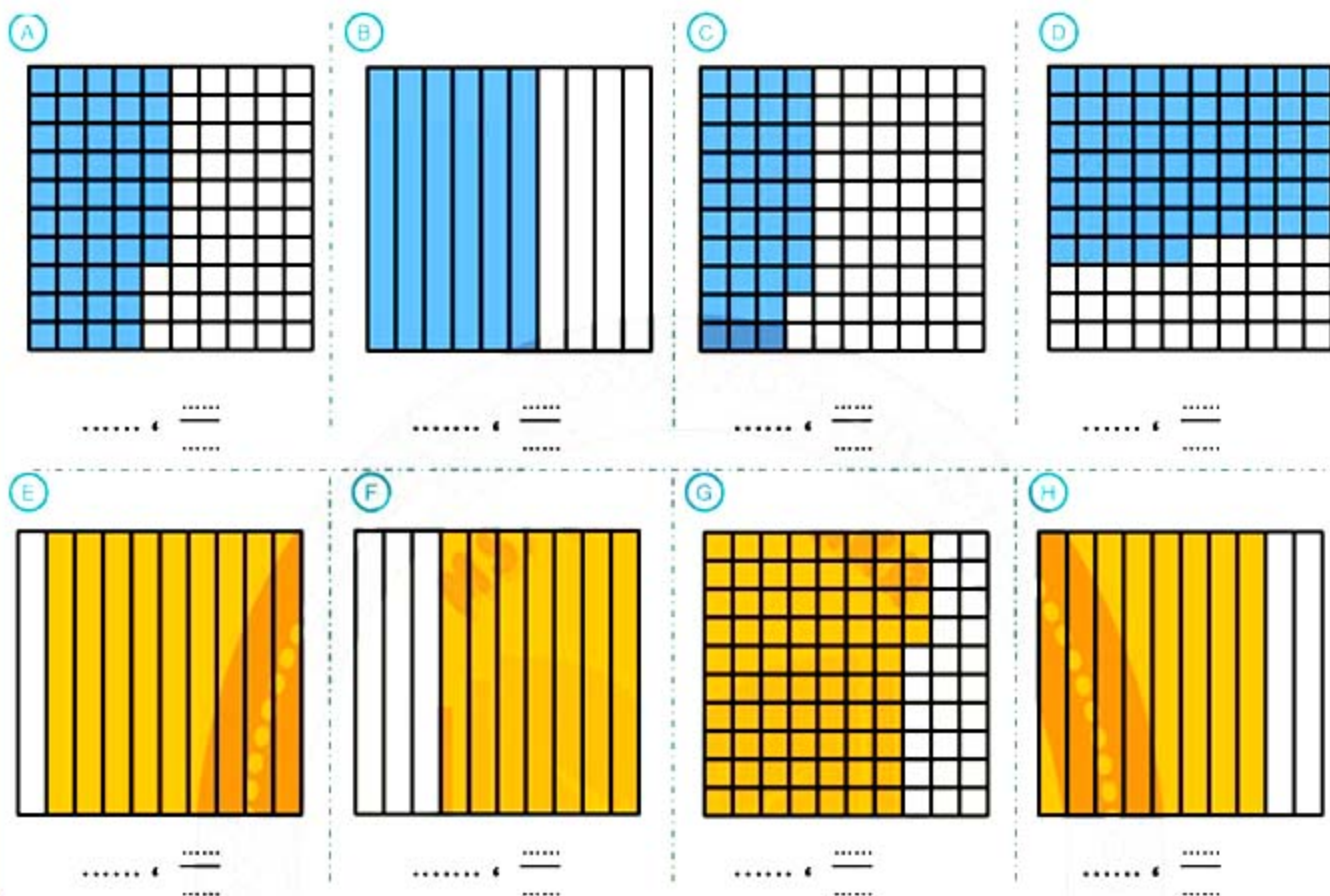
(A) 0.7
(B) 4.73
(C) 47.3
(D) $\frac{473}{10}$
- 8 When there are two digits to the right of the decimal point, to convert to an equivalent fraction we place in the denominator and remove the decimal point.

(A) 10
(B) 100
(C) 1000
(D) 1

2 Complete the following:

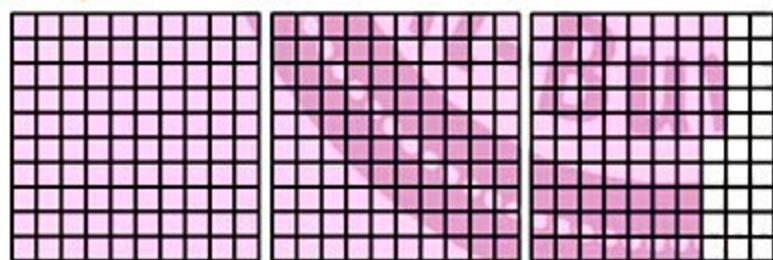
- 1 = $\frac{5}{100}$ (as a decimal fraction)
- 2 = $3\frac{2}{10}$ (as a decimal number)
- 3 3.6 = parts out of ten
- 4 The decimal number 3.04 as a common fraction is
- 5 9 tenths = parts out of one hundred.

- 3 Express each model as a common fraction (or a mixed number) and a decimal fraction (or a decimal number):

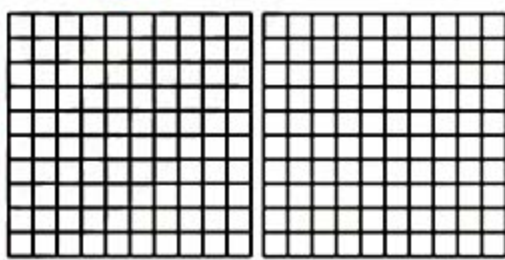


- 4 Shade a model representing each decimal number, then write it as a common fraction, as in the example:

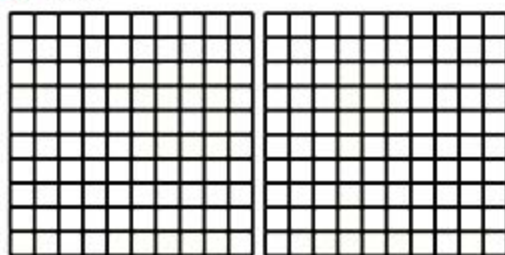
Example: 2.75



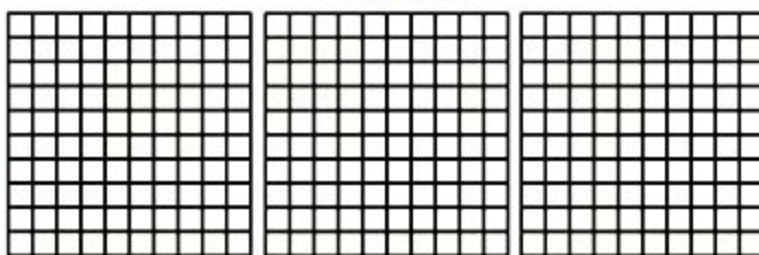
(A) 1.32



(B) 1.45



(C) 2.39





5 Write each of the following as a common fraction or a mixed number:

- (A) $0.3 = \dots\dots\dots$ (B) $0.25 = \dots\dots\dots$ (C) $0.67 = \dots\dots\dots$ (D) $0.6 = \dots\dots\dots$
(E) $0.9 = \dots\dots\dots$ (F) $0.02 = \dots\dots\dots$ (G) $0.23 = \dots\dots\dots$ (H) $3.4 = \dots\dots\dots$

6 Write each of the following as a common fraction, then decompose the units to represent each number in tenths form:

- (A) **5.1** ➤ Common fraction: $\dots\dots\dots$ ➤ Tenths units: $\dots\dots\dots$
(B) **3** ➤ Common fraction: $\dots\dots\dots$ ➤ Tenths units: $\dots\dots\dots$
(C) **1** ➤ Common fraction: $\dots\dots\dots$ ➤ Tenths units: $\dots\dots\dots$
(D) **0.7** ➤ Common fraction: $\dots\dots\dots$ ➤ Tenths units: $\dots\dots\dots$
(E) **0.9** ➤ Common fraction: $\dots\dots\dots$ ➤ Tenths units: $\dots\dots\dots$
(F) **2.3** ➤ Common fraction: $\dots\dots\dots$ ➤ Tenths units: $\dots\dots\dots$

7 Write each number as a common fraction, then decompose it to represent the number in hundredths:

- (A) **3** ➤ Common fraction: $\dots\dots\dots$ ➤ Hundredths units: $\dots\dots\dots$
(B) **1** ➤ Common fraction: $\dots\dots\dots$ ➤ Hundredths units: $\dots\dots\dots$
(C) **2.1** ➤ Common fraction: $\dots\dots\dots$ ➤ Hundredths units: $\dots\dots\dots$
(D) **1.5** ➤ Common fraction: $\dots\dots\dots$ ➤ Hundredths units: $\dots\dots\dots$
(E) **2.3** ➤ Common fraction: $\dots\dots\dots$ ➤ Hundredths units: $\dots\dots\dots$
(F) **10.3** ➤ Common fraction: $\dots\dots\dots$ ➤ Hundredths units: $\dots\dots\dots$

8 Read the following word problems carefully, then answer:

- (A) If Hossam's mass is 65.5 kg.
1 Express Hossam's mass as a mixed number: $\dots\dots\dots$
2 How can you write 65.5 using tenths?
 $\dots\dots\dots$
- (B) Hana drank $1\frac{75}{100}$ cups of juice.
1 Express this amount as a decimal number: $\dots\dots\dots$
2 How can you write $1\frac{75}{100}$ using hundredths?
 $\dots\dots\dots$



Equivalent Fractions

Explore :

During the walk in the park, Saif covered a distance of 0.2 km, and Nabil covered a distance of 0.20 km. **Who covered a greater distance?**

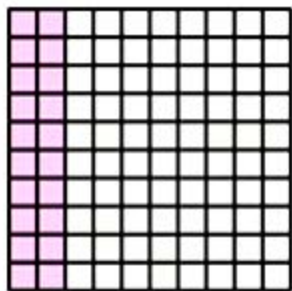
Learn



1 Equivalent Fractions

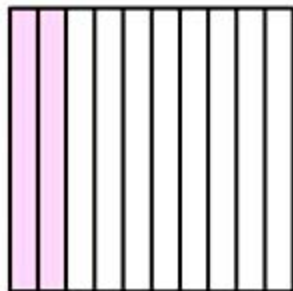
We can use models to represent the distance each of them covered, as follows:

Nabil



$$\frac{20}{100} = 0.20$$

Saif



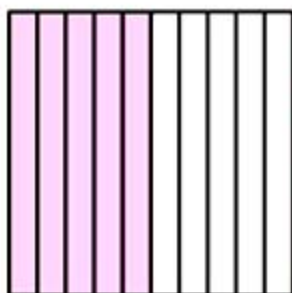
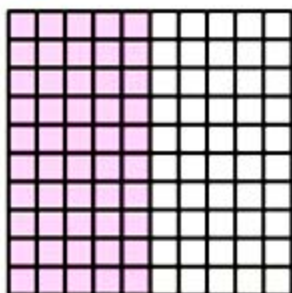
$$\frac{2}{10} = 0.2$$

We notice that both children covered the same distance because the colored parts are equal.

Therefore: 0.2 equivalent 0.20 , $\frac{2}{10}$ equivalent $\frac{2}{100}$

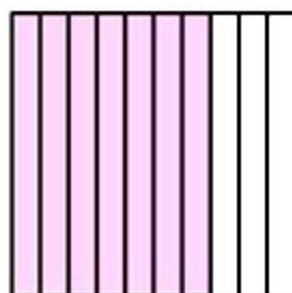
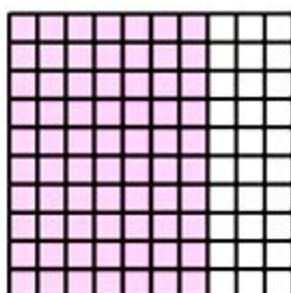
**Example 1**

Write the equivalent fraction and decimal for the shaded part as follows:

1

Common fraction: $\frac{5}{10} = \dots\dots\dots$

Decimal fraction: $0.5 = \dots\dots\dots$

2

Common fraction: $\frac{70}{100} = \dots\dots\dots$

Decimal fraction: $0.70 = \dots\dots\dots$

Solution

- 1** Common fraction: $\frac{5}{10} = \frac{50}{100}$
 Decimal fraction: $0.5 = 0.50$

- 2** Common fraction: $\frac{70}{100} = \frac{7}{10}$
 Decimal fraction: $0.70 = 0.7$

Example 2

Complete by writing each decimal number in the required form:

1 $\frac{5}{10}$

2 $\frac{9}{10}$

3 $\frac{20}{100}$

4 0.10

5 0.7

6 $\frac{80}{100}$

Solution

- | | | |
|----------|-------------------------------------|---------------------------------|
| 1 | ➤ common fraction: $\frac{50}{100}$ | ➤ decimal fraction: 0.50 |
| 2 | ➤ common fraction: $\frac{90}{100}$ | ➤ decimal fraction: 0.90 |
| 3 | ➤ common fraction: $\frac{2}{10}$ | ➤ decimal fraction: 0.2 |
| 4 | ➤ common fraction: $\frac{1}{10}$ | ➤ decimal fraction: 0.1 |
| 5 | ➤ common fraction: $\frac{70}{100}$ | ➤ decimal fraction: 0.70 |
| 6 | ➤ common fraction: $\frac{8}{10}$ | ➤ decimal fraction: 0.8 |

Example 3



Complete by writing the missing number to make an equivalent fraction for the given fraction:

1 $\frac{30}{100} = \frac{\dots}{10}$

2 $\frac{6}{10} = \frac{60}{\dots}$

3 $5\frac{8}{10} = 5\frac{\dots}{100}$

4 $12\frac{50}{100} = 12\frac{5}{\dots}$

5 $17\frac{50}{100} = 17\frac{\dots}{10}$

6 $25\frac{1}{10} = 25\frac{\dots}{100}$

Solution



1

$$12\frac{30}{100} = 12\frac{3}{10}$$

2

$$17\frac{6}{10} = 17\frac{60}{100}$$

3

$$5\frac{8}{10} = 5\frac{80}{100}$$

4

$$12\frac{50}{100} = 12\frac{5}{10}$$

5

$$17\frac{50}{100} = 17\frac{5}{10}$$

6

$$25\frac{1}{10} = 25\frac{10}{100}$$

Try by yourself



Complete by writing the missing number to form an equivalent fraction for the given fraction:

1 $\frac{6}{10} = \frac{60}{\dots}$

2 $\frac{9}{10} = \frac{\dots}{100}$

3 $2\frac{5}{10} = 2\frac{\dots}{100}$



1 Choose the correct answer from the given options:

1 The decimal fraction 0.2 is equivalent to the common fraction

(A) $\frac{2}{100}$

(B) $\frac{2}{10}$

(C) $\frac{10}{2}$

(D) $\frac{1}{2}$

2 $\frac{90}{100} = \frac{\dots\dots\dots}{10}$

(A) 9

(B) 90

(C) 0.9

(D) 900

3 Which of the following is equivalent to the decimal number 10.01?

(A) $1\frac{1}{100}$

(B) $10\frac{1}{10}$

(C) $1\frac{10}{100}$

(D) $10\frac{1}{100}$

4 $2\frac{\dots\dots\dots}{100} = 2\frac{3}{10}$

(A) 3

(B) 30

(C) 300

(D) 3,000

5 The decimal number 6.8 is equivalent to the fraction

(A) $\frac{68}{10}$

(B) $\frac{68}{100}$

(C) $\frac{68}{1,000}$

(D) $\frac{68}{5}$

6 The decimal number that is equivalent to the fraction $\frac{27}{10}$ is

(A) 0.27

(B) 7.2

(C) 2.7

(D) 20.7

7 $\frac{85}{100} = \dots\dots\dots$

(A) 0.58

(B) 5.08

(C) 0.85

(D) 8.5

8 $3\frac{7}{10}$ equivalent to

(A) 7.3

(B) 0.37

(C) 3.70

(D) 37

9 $5\frac{6}{100} = \dots\dots\dots$

(A) 0.56

(B) 5.06

(C) 5.6

(D) 6.5

10 Which of the following is equivalent to the fraction $\frac{3}{10}$?

(A) 0.3

(B) $\frac{3}{100}$

(C) 0.03

(D) $\frac{30}{100}$

2 Complete the following:

1 $\frac{\dots\dots\dots}{10} = \frac{50}{100}$

2 $2\frac{8}{10} = 2\frac{\dots\dots\dots}{100}$

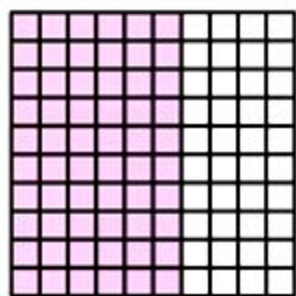
3 $\frac{4}{10} = \frac{40}{\dots\dots\dots}$

4 $\frac{7}{10} = \frac{\dots\dots\dots}{100}$

5 The decimal number equivalent to the fraction $\frac{15}{10}$ is

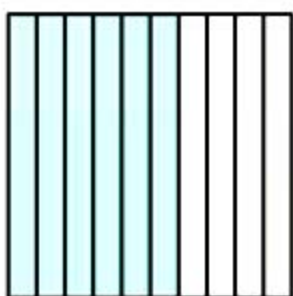
3 Write the decimal fraction that represents the shaded parts in each model:

Example

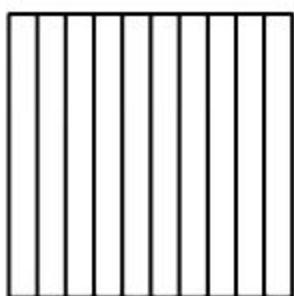


Common fraction: $\frac{6}{10} = \frac{60}{100}$

decimal fraction: $0.6 = 0.60$

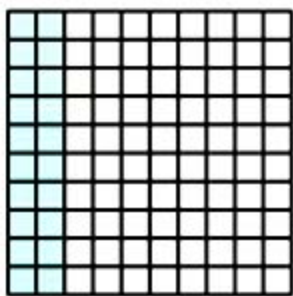


1

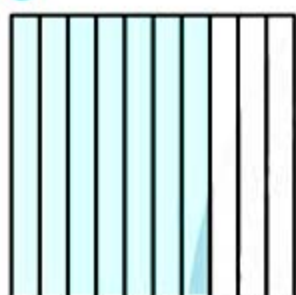


Common fraction: $\frac{20}{100} = \frac{\dots}{\dots}$

decimal fraction: $0.20 = \dots$

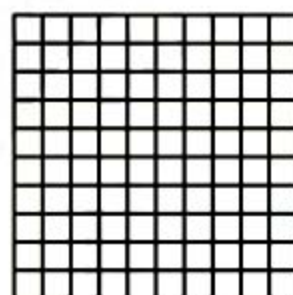


2

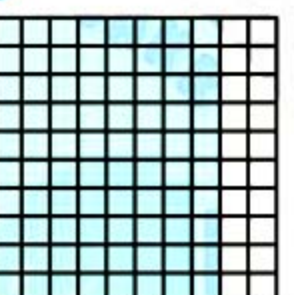


Common fraction: $\frac{7}{10} = \frac{\dots}{\dots}$

decimal fraction: $0.7 = \dots$

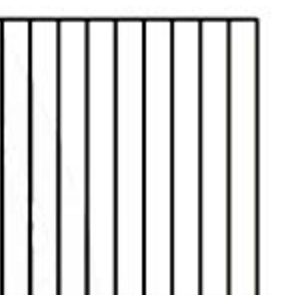


3



Common fraction: $\frac{80}{100} = \frac{\dots}{\dots}$

decimal fraction: $0.80 = \dots$



4 Write the decimal equivalent for each of the following:

1 $0.7 = \dots$ 2 $0.2 = \dots$ 3 $0.60 = \dots$ 4 $0.90 = \dots$

5 $0.8 = \dots$ 6 $0.50 = \dots$ 7 $0.1 = \dots$ 8 $0.40 = \dots$

5 Write the equivalent common fraction for each of the following:

1 $\frac{60}{100} = \dots$ 2 $\frac{5}{10} = \dots$ 3 $\frac{80}{100} = \dots$ 4 $\frac{3}{10} = \dots$

5 $\frac{40}{100} = \dots$ 6 $\frac{9}{10} = \dots$ 7 $\frac{20}{100} = \dots$ 8 $\frac{1}{10} = \dots$

6 Write the common fraction (or mixed number) and the decimal fraction (or decimal number) equivalent to each of the following fractions:

1 $\frac{5}{10}$ ➤ common fraction: $\dots$ ➤ decimal fraction: $\dots$

2 0.2 ➤ common fraction: $\dots$ ➤ decimal fraction: $\dots$

3 $\frac{6}{10}$ ➤ common fraction: $\dots$ ➤ decimal fraction: $\dots$

4 0.4 ➤ common fraction: $\dots$ ➤ decimal fraction: $\dots$



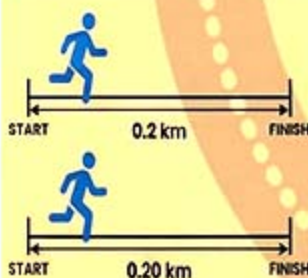
- | | | | |
|---|------------------|--------------------------|---------------------------|
| 5 | $\frac{70}{100}$ | ➤ common fraction: | ➤ decimal fraction: |
| 6 | 0.9 | ➤ common fraction: | ➤ decimal fraction: |
| 7 | $\frac{10}{10}$ | ➤ common fraction: | ➤ decimal fraction: |
| 8 | 0.30 | ➤ common fraction: | ➤ decimal fraction: |
| 9 | 2.1 | ➤ common fraction: | ➤ decimal fraction: |



Same Value, Different Look!

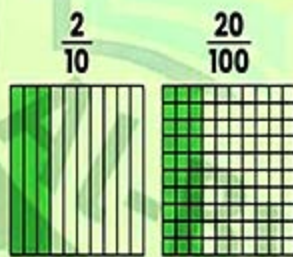
Discover how different fractions and decimals, like 0.2 and 0.20, can represent the exact same amount.

Different Numbers, Same Distance



Walking 0.2 km is the exact same distance as walking 0.20 km.

Tenths are Equal to Hundredths



Shading 2 parts out of 10 ($\frac{2}{10}$) is the same as shading 20 parts out of 100 ($\frac{20}{100}$).

The Equivalence Rule

$$0.7 = 0.70$$

Adding a zero to the end of a decimal doesn't change its value. For example, 0.7 is the same as 0.70.

All Equal!

$$\frac{2}{10} = 0.2$$
$$\frac{20}{100} = 0.20$$

$\frac{2}{10} = \frac{20}{100}$ and $0.2 = 0.20$. These are called equivalent fractions.



Comparing Decimal Fractions and Comparing Common Fractions and Decimal Fractions

Learn



1 Comparing Decimal Fractions Using a Place Value Chart:

Method 1

The two fractions **0.35** and **0.32** can be compared by following these steps:

- 1 We represent the two fractions in a place value chart.
- 2 We compare the digits in the ones place (**0 = 0**).
- 3 We compare the digits in the tenths place (**3 = 3**).
- 4 We compare the digits in the hundredths place (**5 > 2**).

Therefore: **0.35 > 0.32**

ones	Decimal point	tenths	hundredths
0	.	3	5
0	.	3	2

Example 1



Compare using (**>**, **<**, or **=**) with the help of the place value chart:

1 $0.05 \square 0.5$

2 $0.32 \square 0.23$

3 $0.90 \square 0.9$

Solution



1

ones	Decimal point	tenths	hundredths
0	.	5	0
0	.	0	5

$0.05 < 0.5$

2

ones	Decimal point	tenths	hundredths
0	.	2	3
0	.	3	2

$0.32 > 0.23$

3

ones	Decimal point	tenths	hundredths
0	.	9	0
0	.	9	0

$0.90 = 0.9$

**Method 2**

We write the two fractions vertically, aligning the decimal points, and start comparing from left to right as follows:

- ① We compare the ones:

0.36

0.38

The same digit

- ② We compare the tenths:

0.36

0.38

The same digit

- ③ We compare the hundredths:

0.36

0.38

$8 > 6$

The same digit

➤ Therefore: $0.38 > 0.36$

Learn 2**Comparing Fractions in Different Forms**

To compare a fraction and a decimal, they must be converted to the same form so that we can compare them easily.

For example: compare: $3\frac{14}{100}$ and 3.01

To compare the two numbers above, we follow one of the following two methods:

Method 1

- ① We rewrite $3\frac{14}{100}$ as a decimal number.

$$3\frac{14}{100} = 3.14$$

- ② We compare the two decimal numbers

$$3.01 < 3.14$$

Therefore: $3.01 < 3\frac{14}{100}$

Method 2

- ① We rewrite 3.01 as a fraction.

$$3.01 = 3\frac{1}{100}$$

- ② We compare the two fractions.

$$3\frac{1}{100} < 3\frac{14}{100}$$

Therefore: $3.01 < 3\frac{14}{100}$

Example 2



Compare using ($>$), ($<$), or ($=$):

1 $\frac{15}{100}$ 0.

2 0.3 3 hundredths

3 $\frac{23}{10}$ 2

4 0.45 4 ones, 5 tenth

Solution



1 $\frac{15}{100}$ 0.7

0.15 0.70

2 0.3 3 hundredths

0.30 0.03

3 $\frac{23}{10}$ 2.3

2.3 2.3

4 0.45 4 ones, 5 tenth

0.45 4.50



Decimal Duel: How to Compare Numbers

STEP 1: Line Up the Dots

0.38
0.36

Write numbers one above the other, aligning decimal points.

STEP 2: Compare from Left to Right

0.38
0.36

Start with the leftmost digits and move right.

STEP 3: The First Difference Wins

0.38
0.36
0.38 > 0.36

The first place with different digits determines the larger number (e.g., $8 > 6$ means 0.38 is greater).

BONUS TIP: Make Fractions Match

Convert decimals and fractions to the same form to compare (e.g., 3.01 vs $3\frac{14}{100}$).



1 Choose the correct answer from the given options :

- 1 $3.2 \square 5.2$
 (A) $<$ (B) $>$ (C) $=$ (D) Otherwise
- 2 $\frac{8}{10} \square 0.08$
 (A) $<$ (B) $>$ (C) $=$ (D) Otherwise
- 3 $9.3 \square$ Ninety-three tenths
 (A) $<$ (B) $>$ (C) $=$ (D) Otherwise
- 4 The smallest decimal fraction among the following fractions is
 (A) 0.4 (B) 0.19 (C) 0.39 (D) 0.6
- 5 Seven tenths $\square 0.7$
 (A) $<$ (B) $>$ (C) $=$ (D) Otherwise
- 6 $\frac{6}{10} > \dots\dots\dots$
 (A) 0.75 (B) 0.34 (C) 0.7 (D) 0.61

2 Compare using ($>$), ($<$), or ($=$):

- 1 $3.59 \square 35.9$
- 2 $2.06 \square 2\frac{6}{10}$
- 3 $0.39 \square 0.4$
- 4 $0.91 \square 0.9$
- 5 $1.20 \square 1.2$
- 6 $0.6 \square \frac{60}{100}$
- 7 $0.18 \square 0.81$
- 8 $\frac{7}{10} \square 0.35$
- 9 $9.4 \square$ 4 ones , 9 hundredths
- 10 $40.5 \square$ 4 tens , 5 hundredths

3 Rewrite the decimal fractions in the table, then compare using ($>$), ($<$), or ($=$):

1 $0.34 \square 0.4$

ones	.	tenths	hundredths
	.		
	.		

2 $0.45 \square 0.04$

ones	.	tenths	hundredths
	.		
	.		

3 $0.23 \square 0.3$

ones	.	tenths	hundredths
	.		
	.		

4 $0.54 \square 0.45$

ones	.	tenths	hundredths
	.		
	.		

5 $0.62 \square 0.26$

ones	.	tenths	hundredths
	.		
	.		

6 $0.80 \square 0.09$

ones	.	tenths	hundredths
	.		
	.		

4 Compare using ($>$), ($<$), or ($=$):

1 $0.04 \square 0.34$

2 $0.3 \square 0.35$

3 $0.4 \square 0.18$

4 $0.3 \square 0.30$

5 $0.7 \square 0.07$

6 $0.23 \square 0.8$

5 Compare the following numerical forms using ($>$), ($<$), or ($=$):

1 $4 + 0.6 \square 6 \text{ ones, } 4 \text{ hundredths}$

2 $0.1 + 0.06 + 3 \square \text{Thirty hundredths}$

3 $0.5 + 0.03 \square 5 \text{ tenths, } 3 \text{ hundredths}$

4 $\frac{3}{100} \square 3 \text{ tenths}$

5 $6 + 0.5 \square 7, 5 \text{ tenths}$

6 $8.7 \square 0.8 + 0.07$

6 Arrange the following decimal fractions as required:

1 $0.19, 0.18, 0.9, 0.8$ (descending order) $\triangleright$, , ,

2 $0.03, 0.61, 0.6, 0.07$ (ascending order) $\triangleright$, , ,

3 $0.17, 0.09, 0.71, 0.1$ (descending order) $\triangleright$, , ,

4 $0.06, 0.6, 0.43, 0.11$ (ascending order) $\triangleright$, , ,



Adding two fractions with denominators of 10 or 100 using models.

Adding two fractions with denominators of 10 or 100 by converting to equivalent fractions.

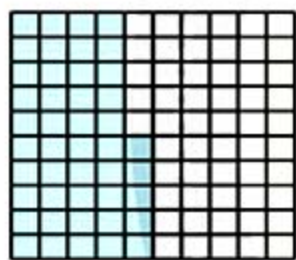
Learn



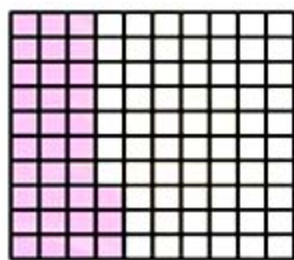
Adding two fractions with denominators 10 or 100 using models:

Adding like fractions:

Add: $\frac{45}{100} + \frac{33}{100}$



+



=



$$\frac{45}{100}$$

+

$$\frac{33}{100}$$

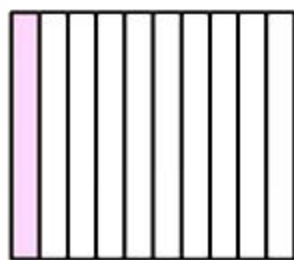
=

$$\frac{78}{100}$$

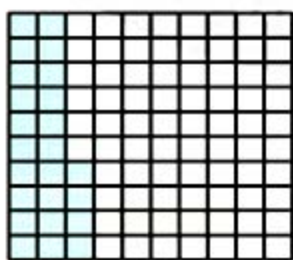
Adding fractions with different denominators:

When adding common fractions with different denominators, we find a common denominator, rewrite the fractions with the new denominator, and then add them.

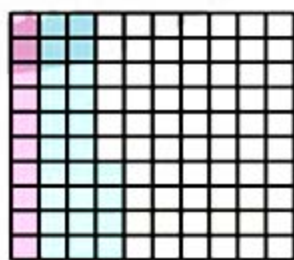
Add: $\frac{1}{10} + \frac{24}{100}$



+



=



Note:

$$\frac{1}{10} = \frac{10}{100}$$

$$= \frac{1}{10} \rightarrow \frac{10}{100}$$

+

$$\frac{24}{100} \rightarrow \frac{24}{100}$$

+

=

$$\frac{34}{100}$$



Example 1



Find the sum using models:

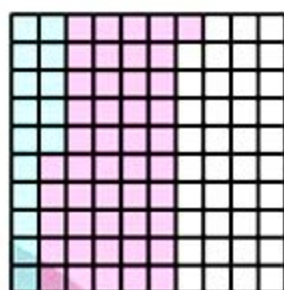
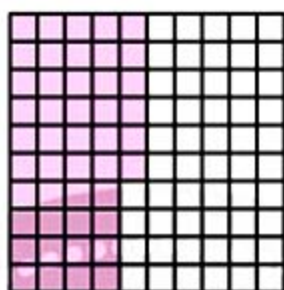
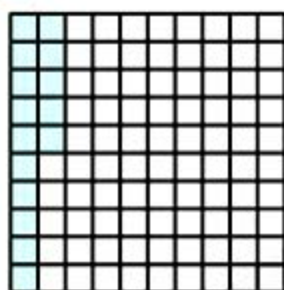
$$1 \quad \frac{15}{100} + \frac{46}{100} = \frac{\dots\dots\dots}{\dots\dots\dots}$$

$$2 \quad \frac{5}{10} + \frac{7}{100} = \frac{\dots\dots\dots}{\dots\dots\dots}$$

Solution



1



$$\frac{15}{100}$$

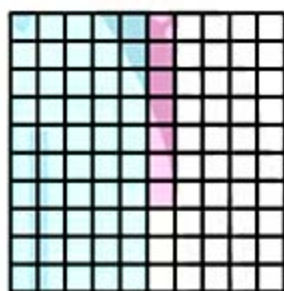
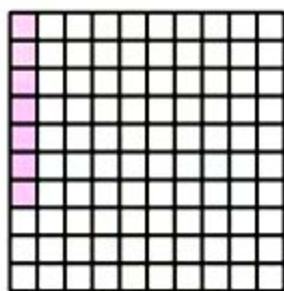
+

$$\frac{46}{100}$$

=

$$\frac{61}{100}$$

2



$$\frac{5}{10}$$

+

$$\frac{7}{100}$$

=

$$\frac{57}{100}$$



Notice that:

$$\frac{5}{10} = \frac{50}{100}$$



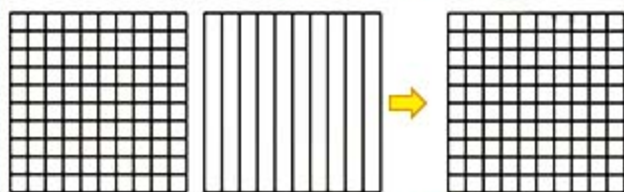
Learn



2 Adding decimal fractions with different denominators:

The sum of $\frac{45}{100} + \frac{3}{10}$ can be found using two strategies as follows:

Strategy 1: Using Models



$$\frac{45}{100} + \frac{3}{10} = \frac{75}{100} = 0.75$$

Strategy 2: Finding the Common Denominator

(Using Equivalent Fractions)

$$\begin{aligned} & \frac{45}{100} + \frac{3}{10} \\ & \quad \downarrow \quad \downarrow \\ & \frac{45}{100} + \frac{30}{100} = \frac{75}{100} = 0.75 \end{aligned}$$

$$\frac{3}{10} \xrightarrow{\times 10} \frac{30}{100}$$

**Learn**

Adding decimal numbers in the form of fractions using equivalent fractions:

The sum of $1\frac{2}{10} + 2\frac{34}{100}$ can be found as follows:

① We add the whole numbers in each of the mixed numbers: ($1 + 2 = 3$)

② We find an equivalent fraction for $\left(\frac{2}{10}\right)$ with a denominator of (100).

$$\frac{2}{10} \xrightarrow{\times 10} \frac{20}{100}$$

$$\begin{aligned} &> 1\frac{2}{10} + 2\frac{34}{100} \\ &= 1\frac{20}{100} + 2\frac{34}{100} \\ &= 3\frac{54}{100} = 3.54 \end{aligned}$$

③ We add the two fractions. $\frac{2}{10} + \frac{34}{100} = \frac{20}{100} + \frac{34}{100} = \frac{20+34}{100} = \frac{54}{100}$

Therefore: $1\frac{2}{10} + 2\frac{34}{100} = 3\frac{54}{100} = 3.54$

Note that:

- Equivalent fractions are fractions that are equal in value but have different numerators and denominators.
- To convert hundredths to tenths, **divide** both the numerator and the denominator $\div 10$.

➤ The sum of $\frac{2}{10} + \frac{7}{100}$ is not equal to $\frac{9}{100}$ because:

$$\begin{aligned} &\frac{7}{100} + \frac{2}{10} \neq \frac{9}{100} \\ &\quad \downarrow \quad \downarrow \\ &= \frac{7}{100} + \frac{20}{100} = \frac{27}{100} \end{aligned}$$

$$\frac{30}{100} \xrightarrow{\div 10} \frac{3}{10}$$

Example 2

Find the result:

① $\frac{2}{10} + \frac{60}{100} = \dots$

② $1\frac{7}{100} + 2\frac{2}{10} = \dots$

③ $\frac{20}{100} + \frac{3}{10} + \frac{1}{10} = \dots$

Solution

① $\frac{2}{10} + \frac{60}{100} = \frac{20}{100} + \frac{60}{100} = \frac{80}{100}$

$$2 \quad 1\frac{7}{100} + 2\frac{2}{10} = 1\frac{7}{100} + 2\frac{20}{100} = 3\frac{27}{100}$$

$$3 \quad \frac{20}{100} + \frac{3}{10} + \frac{1}{10} = \frac{2}{10} + \frac{3}{10} + \frac{1}{10} = \frac{6}{10}$$

Example 3

Find the result as a decimal number:

$$1 \quad \frac{8}{10} + \frac{9}{10} = \dots$$

$$2 \quad \frac{2}{10} + \frac{8}{100} = \dots$$

$$3 \quad 2\frac{7}{10} + \frac{23}{100} + \frac{46}{100} = \dots$$

Solution

$$1 \quad \frac{8}{10} + \frac{9}{10} = \frac{17}{10} = 1.7$$

$$2 \quad \frac{2}{10} + \frac{8}{100} = \frac{20}{100} + \frac{8}{100} = \frac{28}{100} = 0.28$$

$$3 \quad 2\frac{7}{10} + \frac{23}{100} + \frac{46}{100} = 2\frac{70}{100} + \frac{23}{100} + \frac{46}{100} = 2\frac{139}{100} = 3\frac{39}{100} = 3.39$$

Try by yourself

Find the result:

$$1 \quad \frac{4}{10} + \frac{2}{100} = \dots$$

$$2 \quad 1\frac{5}{10} + 1\frac{30}{100} = \dots$$



1 Choose the correct answer from the given options:

1 $\frac{4}{10} + \frac{2}{10} = \dots$

A $\frac{6}{10}$

B $\frac{8}{100}$

C $\frac{10}{6}$

D $\frac{6}{10}$

2 $\frac{1}{10} + \frac{1}{100} = \dots$

A $\frac{2}{10}$

B $\frac{2}{100}$

C 11

D 0.11

3 The sum of $\frac{5}{10} + \frac{13}{100}$ is equivalent to

A 0.36

B 6.3

C 0.63

D 3.6

4 $\frac{2}{10} + \frac{32}{100} = \dots$

A 0.32

B 0.34

C 0.52

D 5.2

5 $\frac{2}{10} + \frac{3}{10} + \frac{9}{10} = \dots$

A 10.5

B 10.4

C 1.4

D 4.1

2 Find the result:

1 $\frac{10}{100} + \frac{27}{100} = \dots$

2 $\frac{3}{10} + \frac{7}{100} = \dots$

3 $\frac{6}{100} + \frac{5}{10} = \dots$

4 $\frac{14}{100} + \frac{6}{10} = \dots$

3 Create equivalent fractions and record your method of increasing or decreasing the numerator and denominator:

1 $\frac{30}{100} = \frac{\dots}{10}$

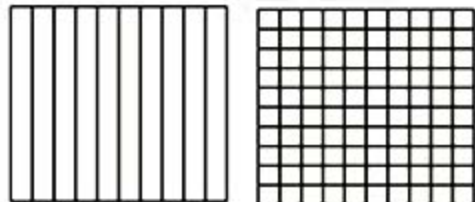
2 $\frac{4}{10} = \frac{40}{\dots}$

3 $\frac{2}{10} = \frac{\dots}{100}$

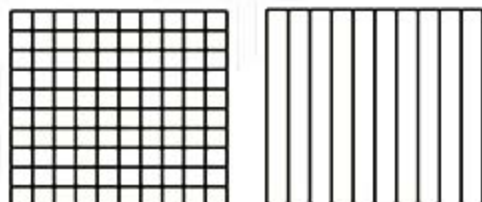
4 $1\frac{70}{100} = 1\frac{7}{\dots}$

4 Represent the following fractions using models, then find the sum:

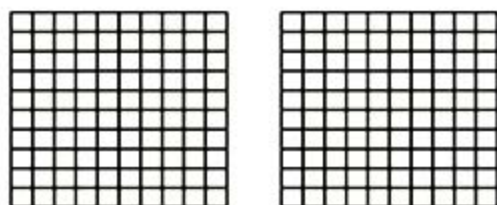
1 $\frac{7}{10} + \frac{28}{100} = \frac{\dots}{\dots}$



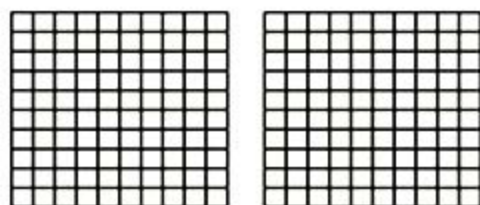
2 $\frac{15}{100} + \frac{3}{10} = \frac{\dots}{\dots}$



3 $\frac{5}{100} + \frac{7}{10} = \frac{\dots}{\dots}$



4 $\frac{8}{10} + \frac{7}{100} = \frac{\dots}{\dots}$



5 Find the result of each of the following:

1 $\frac{2}{10} + \frac{7}{10} = \frac{\dots}{\dots} = \dots$

3 $\frac{30}{100} + \frac{57}{100} = \frac{\dots}{\dots} = \dots$

5 $\frac{7}{10} + \frac{30}{100} = \frac{\dots}{\dots} = \dots$

2 $\frac{32}{100} + \frac{51}{100} = \frac{\dots}{\dots} = \dots$

4 $\frac{1}{10} + \frac{2}{10} + \frac{5}{10} = \frac{\dots}{\dots} = \dots$

6 $\frac{13}{100} + \frac{80}{100} = \frac{\dots}{\dots} = \dots$

6 Solve the following problems using common denominators:

1 $\frac{32}{100} + \frac{5}{10} = \dots$

2 $\frac{6}{10} + \frac{82}{100} = \dots$

3 $1\frac{1}{10} + \frac{20}{100} = \dots$

4 $1\frac{70}{100} + 1\frac{2}{10} = \dots$

5 $3\frac{1}{10} + 2\frac{30}{100} = \dots$

6 $1\frac{25}{100} + 1\frac{3}{10} = \dots$

7 Find the result as a decimal:

1 $\frac{4}{10} + \frac{35}{100} = \dots$

2 $\frac{10}{100} + \frac{6}{10} = \dots$

3 $\frac{7}{10} + \frac{9}{10} = \dots$

4 $\frac{8}{10} + \frac{90}{100} = \dots$

4 $1\frac{5}{10} + \frac{40}{100} = \dots$

5 $1\frac{3}{10} + \frac{70}{100} + \frac{44}{100} = \dots$

8 Read, then answer: (You can use models to illustrate your ideas)

- 1 Fatima poured $\frac{3}{10}$ liter of water into a container that already had $\frac{45}{100}$ liter of water.

How many liters of water are in the container now?

.....

- 2 Two pens: one has a mass of $\frac{1}{10}$ kilogram, and the other has a mass of $\frac{8}{100}$ kilogram.

What is the total mass of the two pens?

.....

Unit 11

Data with Fractions



Lessons

1

Different Representations
of Data

2

Dot Plot

3

Analyzing Graphs

Different Representations of Data

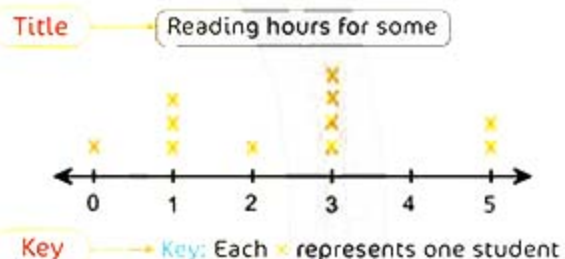
Learn 1 Graphs:

Graphs: are a method through which data can be represented, read, and analyzed,

such as:

① Dot plot:

► It shows the frequency of data by placing marks above a number line with a key indicating what each mark represents.



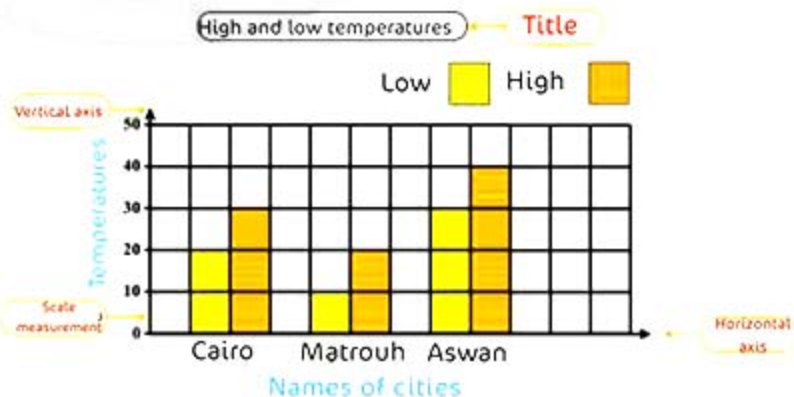
② Bar graphs:

► This type is used to represent data using individual bars to compare different sets of data.



③ Double bar graphs:

► They are used to display two sets of data in the same graph using paired bars, allowing us to analyze and compare more complex data sets.



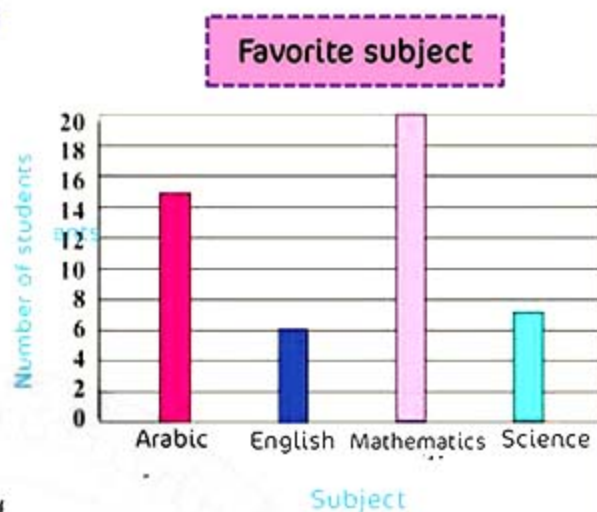


Example 1



Using the graph, answer the following questions:

- 1 What subject do the largest number of students prefer?
- 2 How many students prefer Arabic?
- 3 What is the difference between the number of students who prefer Science and those who prefer English?
- 4 What is the total number of students who prefer Math and Science?



Solution



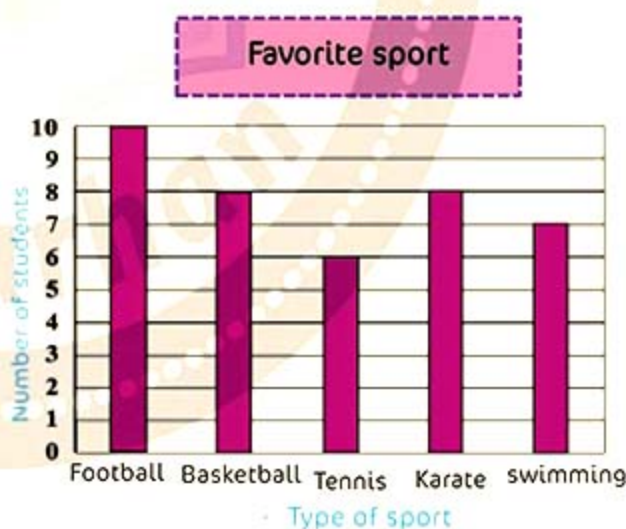
- 1 Math
- 2 15 students
- 3 1 student ($1 = 6 - 7$)
- 4 27 students ($27 = 7 + 20$)

Try by yourself



The bar graph below shows the favorite sports of a group of students at a school. Examine the graph, then answer:

- 1 Which sport do the largest number of students prefer?
- 2 Which sport do the fewest number of students prefer?
- 3 What is the total number of students who prefer football and swimming?
- 4 Which sports are preferred by an equal number of students?
- 5 What is the difference between the number of students who prefer karate and those who prefer tennis?
- 6 What is the total number of students?



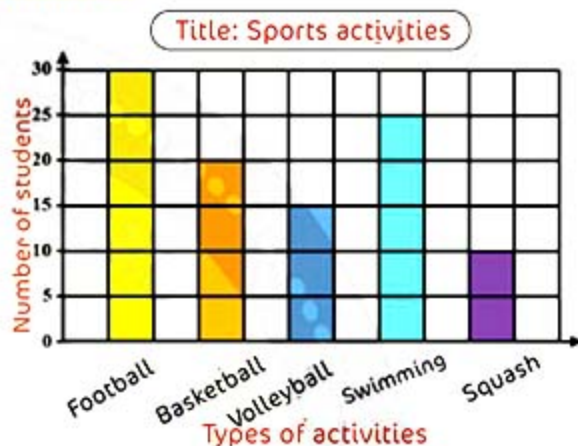
Learn 2 Bar Graph Representation:

► The following table shows the sports activities practiced by a group of fourth-grade students in a school:

Sport activity	Football	Basketball	Volleyball	Swimming	Squash
Number of students:	30	20	15	25	10

These data can be represented using bar graphs as follows:

- 1 We determine a title for the bar graph (Sports activities).
- 2 We draw the horizontal axis and mark the types of activities on it.
- 3 We draw the vertical axis, which represents the number of students.
- 4 We set the scale on the vertical axis by dividing it into equal intervals ...
0 → 5 → 10 → 15
- 5 We draw a bar for each sport (each bar represents the number of students participating in that activity).



Learn 3 Double Bar Graph Representation:

► The table shows the activities practiced by a group of fourth grade boys and girls in a school.

Activity	Football	Basketball	Volleyball	Swimming	Squash
Number of boys	25	10	10	10	5
Number of girls	5	10	5	15	5

To represent this data using a double bar graph, follow these steps:

- 1 We follow the same steps used in the bar graph: (title selection – drawing horizontal and vertical axes – determining the scale).
- 2 We draw two bars for each one represents the number of boys, and the other represents the number of girls.
- 3 We set a key for each category:

- Boys → ■
- Girls → ■





Example 2



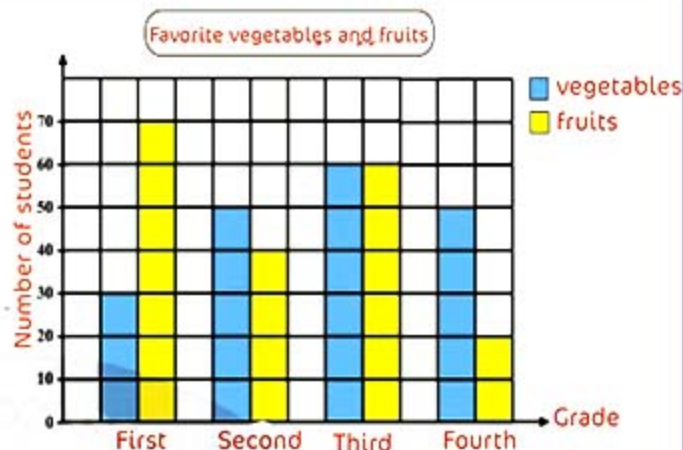
Using the adjacent graph, answer:

1 What is the number of students who fruit in first and second grade?

2 What is the number of students who like vegetables in first and fourth grade?

3 In which grade is the largest number of students who prefer fruit?

4 In which grade is the fewest number of students who prefer fruit?



Solution



1 110 students (because: $110 = 40 + 70$)

2 80 students (because: $80 = 50 + 30$)

3 First grade

4 Fourth grade

Example 3



Choose the suitable type of graph for each of the following:

1 The number of study hours for Ahmed and Khaled during the week.

2 The favorite sport of a group of students.

3 The maximum and minimum temperatures in Aswan during May.

4 The heights of a group of plants.

Solution



1 Double bar graph

2 Bar graph

3 Double bar graph

4 Dot plot



1 Choose the correct answer from the given options :

- 1 A double bar graph is used to display of the data.
 (A) A set (B) Two sets (C) 3 sets (D) 4 sets
- 2 The vertical and horizontal lines on the graph are called
 (A) A title (B) Axes (C) A key (D) Numerical groups
- 3 The graph by is used to represent data using single bars.
 (A) Double bars (B) Dots (C) Bars (D) Picture
- 4 One of the elements of the graph is
 (A) The title (B) The favorite color
 (C) Study hours (D) Height
- 5 The appropriate graph to represent the heights of students in a class is the graph by
 (A) Double bars (B) Dots (C) Bars (D) Picture
- 6 To compare rainfall data in the African desert during 2022 and 2023, the suitable representation of the data is
 (A) Pictograph (B) Bar graph (C) Dot plot (D) Double bar graph
- 7 The graph by is the most suitable to display data that contains numbers using a number line by placing an (X) above the line.
 (A) Bars (B) Double bars (C) Dots (D) Picture
- 8 The appropriate graph to compare maximum and minimum temperatures during one day in several cities is the graph by
 (A) Double bars (B) Dots (C) Bars (D) Picture
- 9 In the adjacent table: the number of students who prefer Mathematics = students.

(A) 20

(B) 25

(C) 30

(D) 75

Subject	Mathematics	Science	Arabic
Number of students	30	20	25

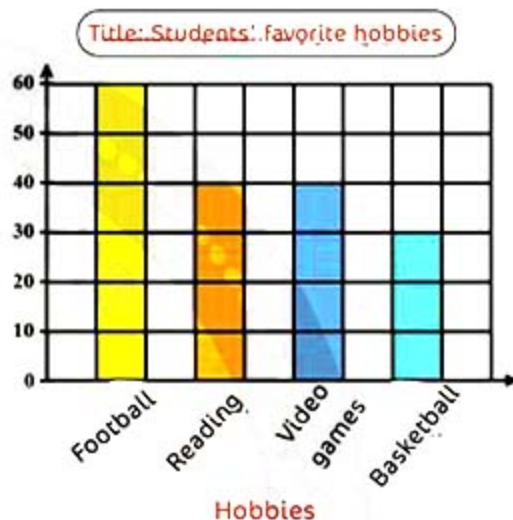


10 Each of the following is represented by bars for a group of students except

- A School activities
- B Favorite subject
- C The favorite color among boys and girls
- D Subject grades

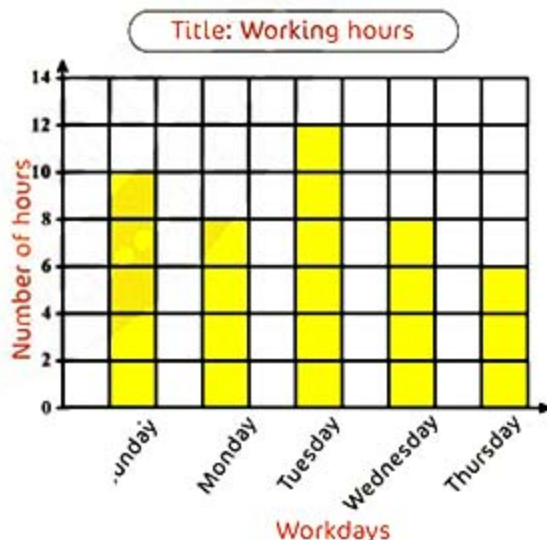
2 Use the bar graph «Students' Favorite Hobbies» to answer the following questions:

- 1 Which hobby is preferred by the largest number of students?
.....
- 2 How many students prefer football?
..... students
- 3 What is the total number of students who prefers video games and reading together?
..... students
- 4 Can this data be represented using double bars?
.....

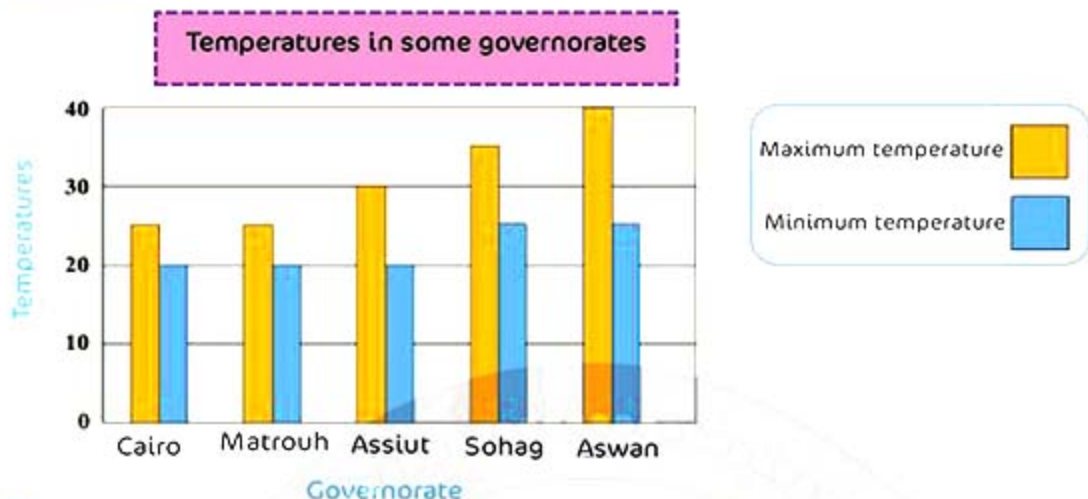


3 The adjacent graph represents Shadi's working hours over 5 consecutive days; observe the graph then answer:

- 1 How many hours does Shadi work on Sunday?
.....
- 2 Which day did Shadi work the longest hours?
.....
- 3 What is the total number of working hours on Sunday and Monday?
.....
- 4 On which days did Shadi work the same number of hours?
.....
- 5 What is the total number of hours Shadi worked over the 5 days?
.....



4 Complete :

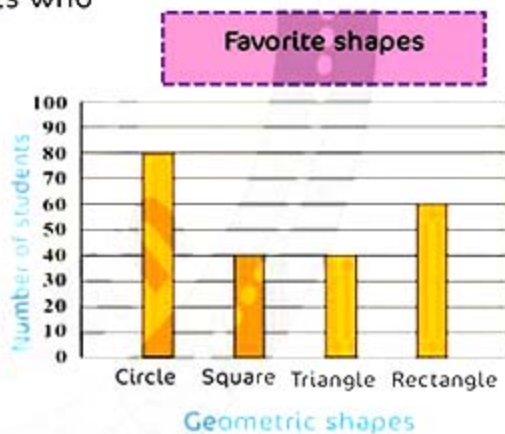


- What is the minimum temperature in Sohag Governorate?
- What is the difference between the maximum and minimum temperatures in Cairo Governorate?
- Which governorate has a maximum temperature exceeding 35 degrees?

5 Answer the following:

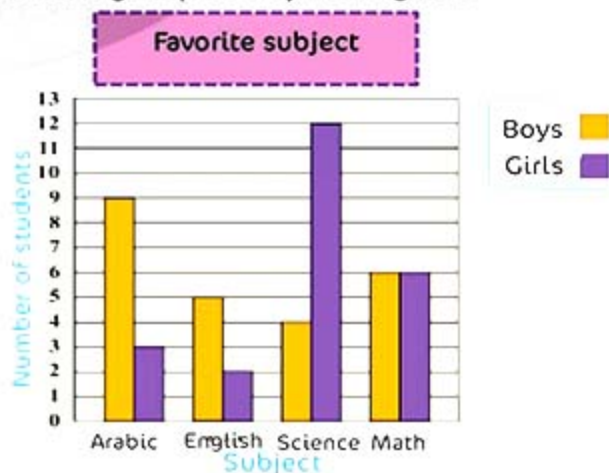
(A) The adjacent graph shows the number of students who prefer some geometric shapes. **Complete:**

- The geometric shapes preferred by an equal number of students are and
- The difference between the number of students who prefer the circle and those who prefer the rectangle =



(B) The adjacent graph shows the favorite subject for a group of boys and girls. **Observe the graph, then answer:**

- Which subject is preferred by the largest number of girls?
- Which subject is preferred by an equal number of boys and girls?
- How many boys prefer English?



التمثيل البياني بالنقاط

Learn



1 Dot Plot Chart:

► The following data shows the distances of some students travel from home to school:

$\frac{1}{5}$ Km, $\frac{4}{5}$ Km, $\frac{4}{5}$ Km, $\frac{5}{5}$ Km, $\frac{4}{5}$ Km, $\frac{2}{5}$ Km, $\frac{4}{5}$ Km, $\frac{5}{5}$ Km, $\frac{2}{5}$ Km, $\frac{2}{5}$ Km, $\frac{3}{5}$ Km

We can represent this data using a dot plot as follows:

- ① Draw a number line and set an appropriate title and key for the graph.
- ② Choose an appropriate scale by identifying the smallest value ($\frac{1}{5}$) and the largest value ($\frac{5}{5}$), therefore the suitable scale is ($\frac{1}{5}$).
- ③ Use the symbol X to represent the fraction once, and every time it repeats, write another X above it.

Distance from home to school (in kilometers)



Key: Each X represents one student

From the dot plot representation of the previous data, we find that:

- ① The total number of students who recorded their answers in the survey is 11, which equals the number of X marks.
- ② The shortest distance students travel to school is $\frac{1}{5}$ km.
- ③ The longest distance students travel to school is $\frac{5}{5}$ km.
- ④ The distance most students travel to school is $\frac{4}{5}$ km.

Note that:



The data represented using a dot plot must be “numbers”.

Example 1



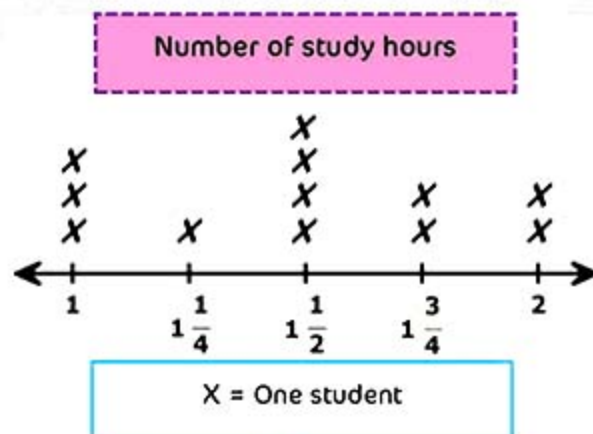
Doaa conducted a survey for a group of students about the number of hours they study math during the day, and the data was as follows:

$$1\frac{1}{4}, 1\frac{1}{2}, 1, 1\frac{3}{4}, 1\frac{1}{2}, 2, 1, 1\frac{3}{4}, 2, 1\frac{1}{2}, 1, 1, 1\frac{1}{2}$$

Draw a dot plot to represent the previous data, then answer:

- 1 What duration do most students study?
.....
- 2 What is the shortest duration that students study?
.....
- 3 How many students study for two hours?
.....
- 4 What is the difference between the number of students who study for 1 hour and those who study for $1\frac{1}{4}$ hours?
.....
- 5 What is the total number of students who participated in the survey?
.....

Solution



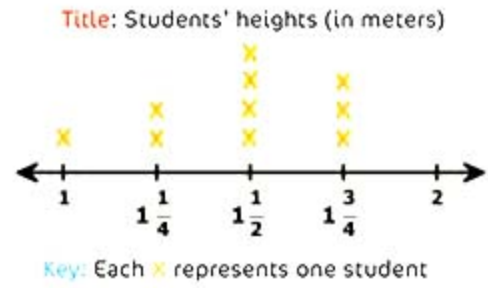
- | | | |
|--------------------------------|--|----------------|
| 1 $1\frac{1}{2}$ hours | 2 1 hour | 3 Two students |
| 4 Two students ($2 = 3 - 1$) | 5 12 students ($12 = 2 + 2 + 4 + 1 + 3$) | |



Example 2



The adjacent dot plot shows the heights of some students in meters; observe the plot and answer the following questions:



- What is the difference between the number of students whose height is $1\frac{3}{4}$ m and $1\frac{1}{4}$ m?
- What is the most frequent height among the students?
- How many students have a height of $1\frac{1}{4}$ meters?

Solution



- 1 student
- $1\frac{1}{2}$ meters
- 2 students

Try by yourself



Represent the following data showing the heights of some plants in centimeters using a dot plot:

4 . $4\frac{1}{4}$. $5\frac{1}{2}$. $4\frac{1}{4}$. 4 . 5 . 5 . $4\frac{1}{2}$. $5\frac{1}{4}$. $4\frac{1}{2}$. 4 . $5\frac{1}{4}$

Exercises on Dot Plot Representation



1 Choose the correct answer from the given options :

1 The key (X = one student) is used in the graph of

- (A) Double bars (B) Bar graphs
(C) Art (D) Double bar graphs

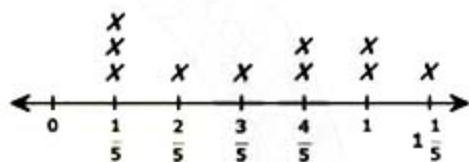
2 The adjacent figure represents the graph by

- (A) Bars (B) Pictographs
(C) Dots (D) Double bars



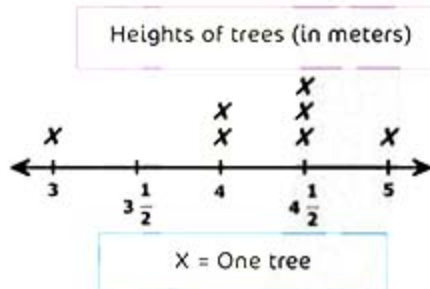
3 The most frequent distance on the adjacent dot plot is

- (A) $1\frac{1}{5}$ (B) $\frac{3}{5}$
(C) $\frac{4}{5}$ (D) $\frac{1}{5}$



4 The following dot plot represents the heights of some trees in meters in a garden:

- (A) 3 (B) $3\frac{1}{2}$
(C) 4 (D) $4\frac{1}{2}$

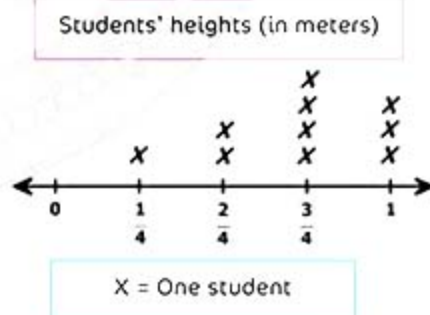


2 Complete the following:

(A) The suitable graph to display frequency of data on a number line is

(B) Observe the dot plot:

- 1 The number of students each of whom is 1 meter tall =
2 The most frequent height among the students =
3 The number of students each of whom is $\frac{3}{4}$ meter tall =





3 Observe the data represented by the dot plot that shows the number of study hours a group of students spent on Friday, then answer the following questions:

1 How many students spent $1\frac{3}{5}$ hours studying?

.....

2 What is the total number of students who recorded their answers in the survey?

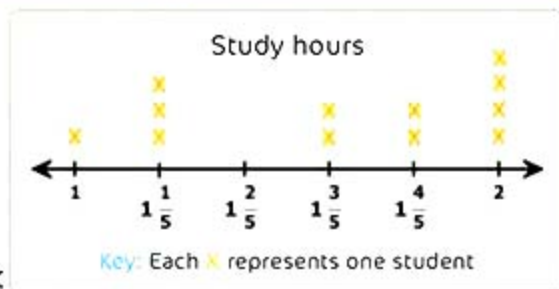
.....

3 How many hours did the largest number of students spend studying?

.....

4 What is the smallest number of hours students spent studying?

.....



4 Observe the data represented on the dot plot that indicates the heights of plants in centimeters in the backyard garden, then answer the following questions:

1 What is the most frequent height among the plants?

.....

2 How many plants are represented on the dot plot?

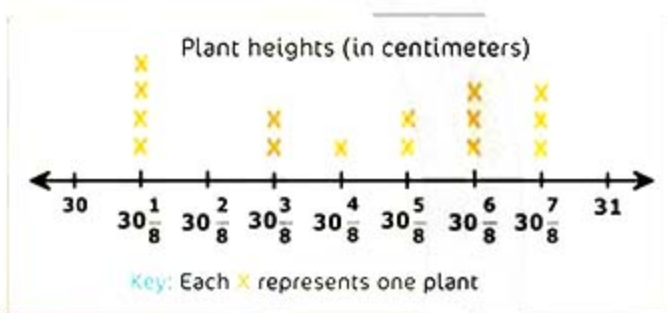
.....

3 Which heights have no representation?

.....

4 What is the least repeated height among the plant heights?

.....



5 Plot a dot plot to show the lengths of Mariam's colored pencils, then answer the following questions:

Address:

Key:

Lengths in centimeters		
$4\frac{3}{4}$	$4\frac{2}{4}$	$4\frac{1}{4}$
$4\frac{3}{4}$	$4\frac{1}{4}$	$4\frac{3}{4}$
4	$4\frac{3}{4}$	5
$4\frac{2}{4}$	5	$4\frac{3}{4}$

- 1 How many pencils represent lengths greater than $4\frac{2}{4}$ cm?
.....

- 2 What is the most frequent length of the pencils?
.....

- 3 What is the least frequent length of the pencils?
.....

- 6 The following data show the amount of liquid (in liters) in different bottles. Represent the following data using a dot plot, then complete:

$\frac{8}{8}$, $\frac{6}{8}$, $\frac{4}{8}$, $\frac{4}{8}$, $\frac{6}{8}$, $\frac{4}{8}$, $\frac{2}{8}$, $\frac{8}{8}$, $\frac{8}{8}$, $\frac{6}{8}$, $\frac{1}{8}$, $\frac{6}{8}$, $\frac{7}{8}$, $\frac{8}{8}$, $\frac{2}{8}$

- 1 The number of bottles that contain $\frac{2}{8}$ liter equals
- 2 The total number of bottles that have $\frac{4}{8}$ liter and $\frac{1}{8}$ liter equals
- 3 The number of bottles that have $\frac{7}{8}$ liter or more equals

Address:

Key:

- 7 The following data show the number of hours browsing the Egyptian Knowledge Bank by a group of students. Create a dot plot, then answer:

$1\frac{1}{2}$, $1\frac{3}{4}$, $1\frac{1}{4}$, $1\frac{3}{4}$, $1\frac{1}{4}$, $1\frac{1}{2}$, $1\frac{1}{4}$, $2\frac{1}{4}$, $1\frac{1}{2}$, $1\frac{3}{4}$, $1\frac{3}{4}$, $1\frac{1}{2}$, $1\frac{3}{4}$

- 1 What duration do the largest number of students browse the Egyptian Knowledge Bank?
- 2 What is the shortest duration students browse the Egyptian Knowledge Bank?
- 3 What is the difference between the number of students who browse for $1\frac{1}{2}$ hours and $2\frac{1}{5}$ hours?

Address:

Key:

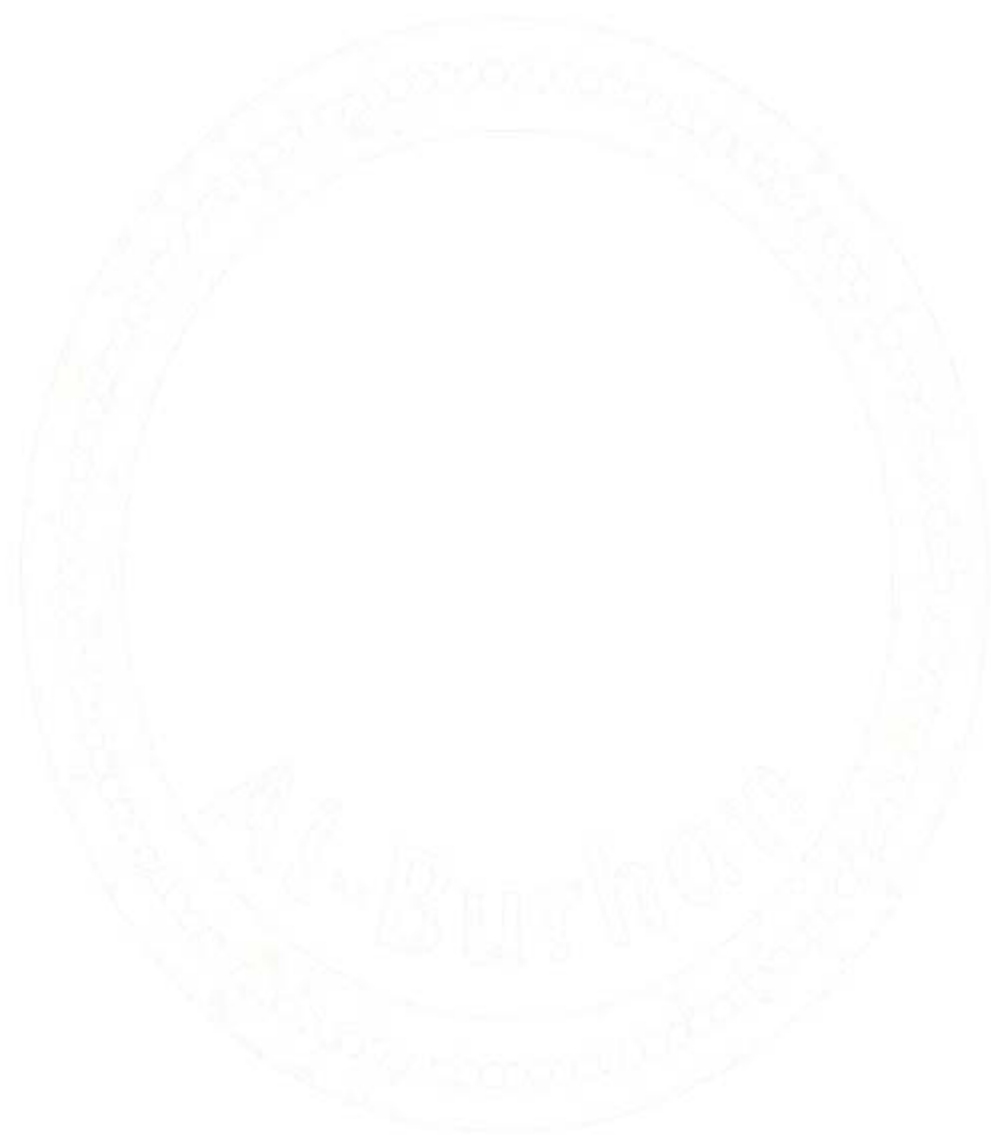


8 Answer the following:

The following data show the distance (in km) that a group of students travel from their homes to school.

$$\frac{1}{5} \cdot \frac{4}{5} \cdot \frac{4}{5} \cdot \frac{2}{5} \cdot \frac{4}{5} \cdot \frac{2}{5} \cdot \frac{3}{5}$$

Represent these data using a dot plot.





Analyzing Graphical Representation

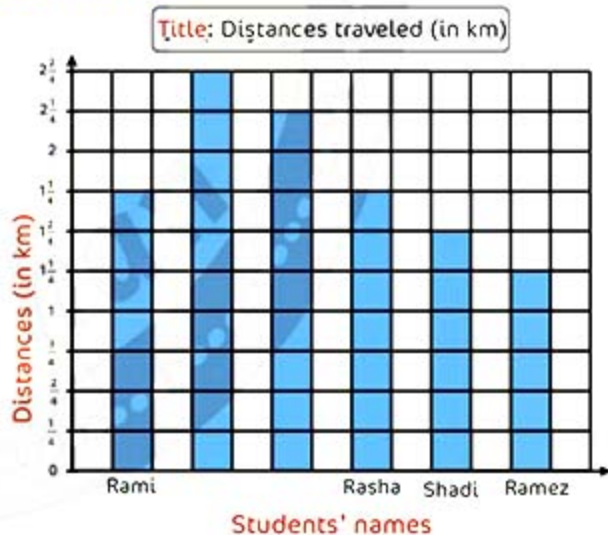
Learn 1 Bar graphs for data that contains fractions:

► One student recorded the distances that a group of students walk to school, as shown in the following table.

Student name	Rami	Hoda	Sameer	Rasha	Shady	Ramz
Distance in km	$1\frac{3}{4}$	$2\frac{2}{4}$	$2\frac{1}{4}$	$1\frac{3}{4}$	$1\frac{1}{2}$	$1\frac{1}{4}$

These data can be represented using bar graphs as follows:

- ① We determine the title of the graph:
(Distances walked in km).
- ② Draw the horizontal axis and label it with:
(Names of students).
- ③ Draw the vertical axis and label it with:
(Distances in km).
- ④ Determine the scale on the vertical axis,
for example: $\frac{1}{4}$.
- ⑤ Draw a bar representing the distance
each student walks in km.





Example 1



The following table represents the heights of a group of students in meters. Represent these data using bar graphs, then answer:

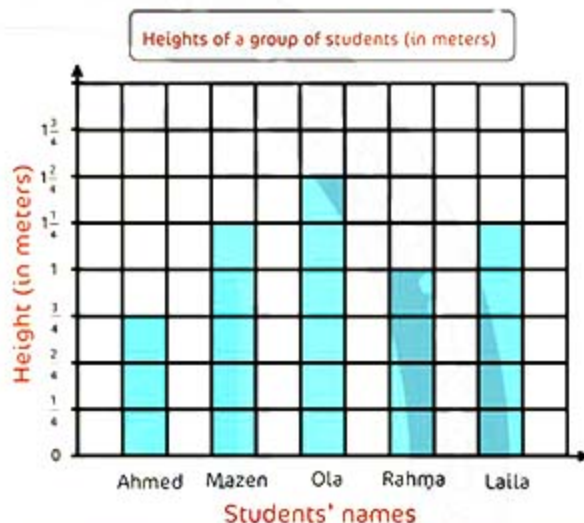
Names of students	Ahmed	Mazen	Ola	Rahma	Laila
Height in meters	$\frac{3}{4}$	$1\frac{1}{4}$	$1\frac{2}{4}$	1	$1\frac{1}{4}$

- 1 Which student is the tallest?
.....
- 2 Which student is the shortest?
.....
- 3 Which two students have the same height?
.....

Solution



- 1 Ola
- 2 Ahmed
- 3 Mazen and Laila



Example 2



The following table shows the sales of a store of a certain product (in kilograms) over five days.

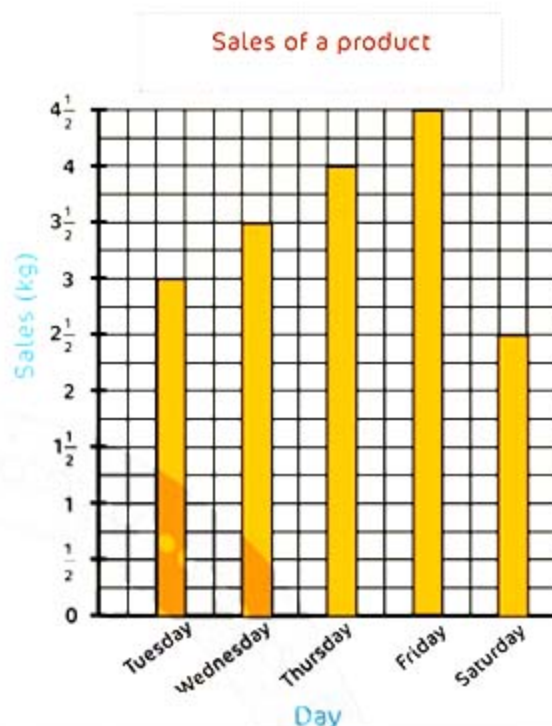
Day	Tuesday	Wednesday	Thursday	Friday	Saturday
Sales	3 Kg	$3\frac{1}{2}$	4 Kg	$4\frac{1}{2}$ Kg	$2\frac{1}{2}$ Kg

Represent the data using bar graphs, then answer the following questions:

- 1 Which day did the store sell the largest quantity of the product?
- 2 What is the difference between the sales on Tuesday and Saturday in kilograms?
- 3 What is the total sales on Wednesday and Thursday in kilograms?

Solution

- 1 Friday
- 2 $\frac{1}{2}$ kg; because: $3 - 2\frac{1}{2} = \frac{1}{2}$
- 3 $7\frac{1}{2}$ kg; because: $3\frac{1}{2} + 4 = 7\frac{1}{2}$

**Try by yourself**

The following table shows the number of liters of water Nourhan drank during some days of the week.

Day	Saturday	Sunday	Monday	Tuesday
Liters	$1\frac{1}{2}$	$2\frac{1}{2}$	2	$1\frac{1}{2}$

Represent the previous data using bar graphs.

**Learn****1 Double bar graph representation for data that contains fractions:**

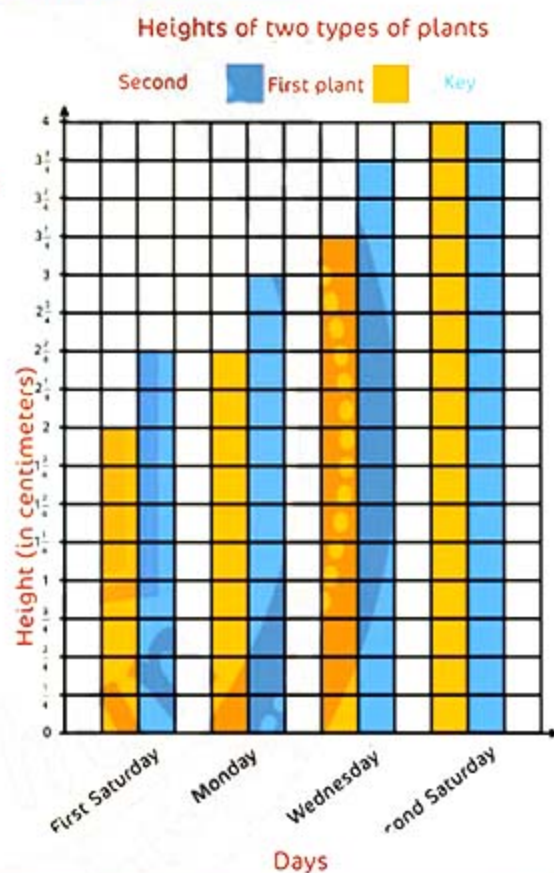
► Ahmed planted two different types of plants, and after some growth, he recorded their heights to the nearest $\frac{1}{4}$ cm every few days as shown in the table.

days \ Plant type	First Saturday	Monday	Wednesday	Second Saturday
First plant	2 cm	$2\frac{2}{4}$ cm	$3\frac{1}{4}$ cm	4 cm
Second plant	$2\frac{2}{4}$ cm	3 cm	$3\frac{3}{4}$ cm	4 cm

These data can be represented using a double bar graph as follows:

- Determine a title for the graph:
(Heights of two types of plants)
- Draw the horizontal axis and label it with days.
- Draw the vertical axis and label it with height (in cm).
- Determine the scale by dividing the space between two whole numbers into four equal parts so each part represents $\frac{1}{4}$ cm.
- Draw two bars for each day: one for the first plant and the other for the second.
- Identify the color key for each plant:

- First plant → 
- Second plant → 



Example 3

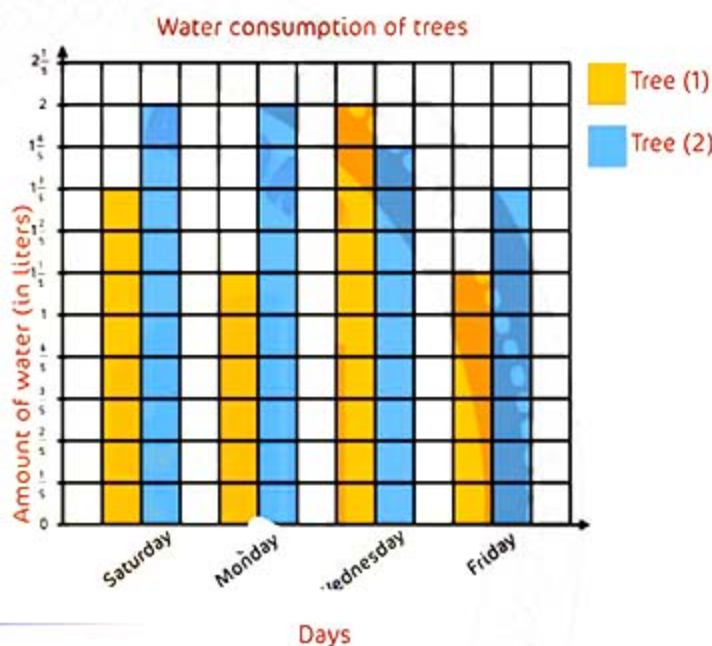


The adjacent table shows the amount of water consumed by two trees over 4 days in liters. Represent the data shown in the table using a double bar graph, then answer:

Days \ Trees	Saturday	Monday	Wednesday	Friday
Tree (1)	$1\frac{3}{5}$	$1\frac{1}{5}$	2	$1\frac{1}{5}$
Tree (2)	2	2	$1\frac{4}{5}$	$1\frac{3}{5}$

1 What is the total amount of water the two trees consumed on Saturday?

2 On which day did tree (2) consume more water than tree (1)?



Solution

- 1 3 liters (because: $\triangleright 1\frac{3}{5} + 2 = 3\frac{3}{5}$)
- 2 Saturday, Wednesday and Friday

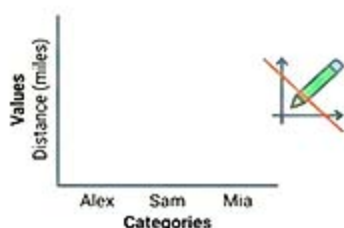


How to Make a Bar Graph with Fractions

Distances Walked to School

1. Start With a Title

Give your graph a clear title that explains what data it shows (e.g., "Distances Walked to School").



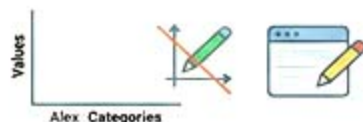
Create a horizontal axis for categories (like names or days) and a vertical axis for the values (like height or distance).

2. Draw and Label Axes
(like names or days)

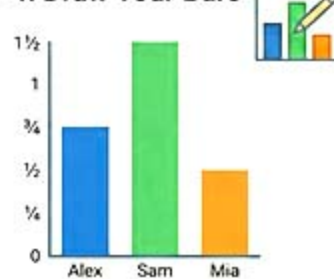
3. Set Your Fractional Scale



Mark the vertical axis with a scale that includes fractions, dividing whole numbers into equal parts like $\frac{1}{4}$ s or $\frac{1}{2}$ s.



4. Draw Your Bars



For each category, draw a bar that reaches the correct height corresponding to its fractional value on the scale.

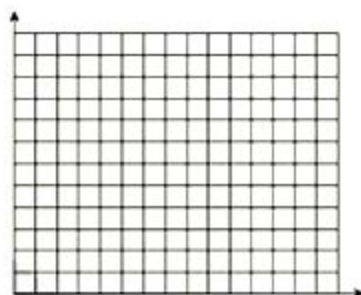
Exercises on Dot Plot Representation



1 Observe the following tables, then represent as required:

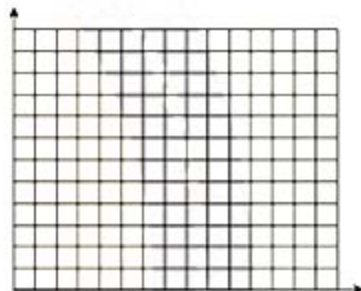
- 1 The following table shows the heights of some trees in meters; represents the heights using bar graphs.

Trees	Tree (1)	Tree (2)	Tree (3)	Tree (4)
Heights in meters	$1\frac{3}{4}$	$2\frac{2}{4}$	$2\frac{1}{4}$	$1\frac{2}{4}$



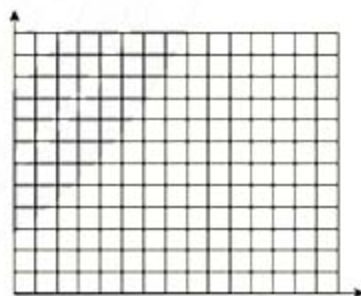
- 2 The following table shows the distances Reem runs on some days of the week in kilometers; represent that data using bar graphs:

Day	Saturday	Sunday	Wednesday	Friday
Distances in kilometers	2	$1\frac{1}{2}$	1	$\frac{1}{2}$



- 3 The following table shows the numbers of participants in some school activities from fourth and fifth grade; observe the table then represent the data using double bar graphs:

Activities Grades	Sports activity	Cultural activity	Scientific activity	Social activity
Fourth grade	35	40	25	20
Fifth grade	25	15	30	20

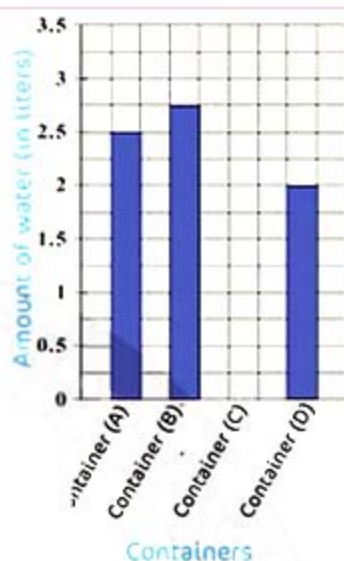


2 The following table shows the amount of water in liters for four water containers.

Complete the representation of the data with the corresponding bar charts, then answer:

Container	Amount of water (in liters)
Container (A)	2.5
Container (B)	2.75
Container (C)	3
Container (D)	2

Amount of water (in liters) for four containers

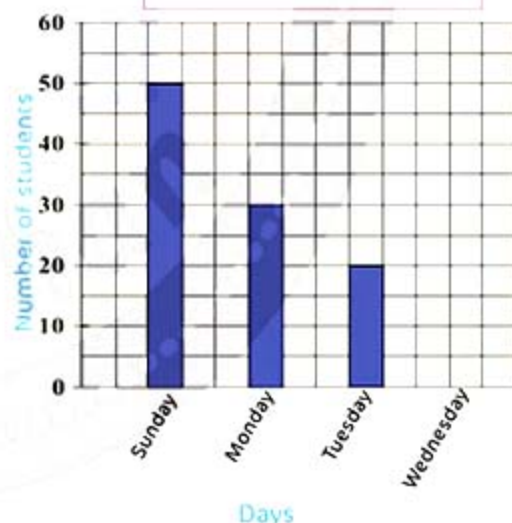


- Which container contains the least amount of water?
- Which container contains the largest amount of water?
- What is the total amount of water in containers (b) and (a)?

3 Using the following table complete:

The day	Number of students
Sunday	50
Monday	30
Tuesday	20
Wednesday	60

Students' absence



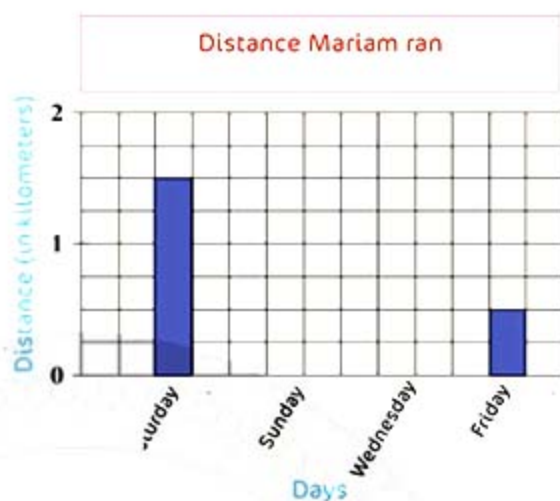
- Represent Wednesday graphically.
- The number of students who were absent on Tuesday =
- The day on which the largest number of students were absent is



4 The following graph shows the distance Mariam ran in kilometers on the shown days.

Complete the graph:

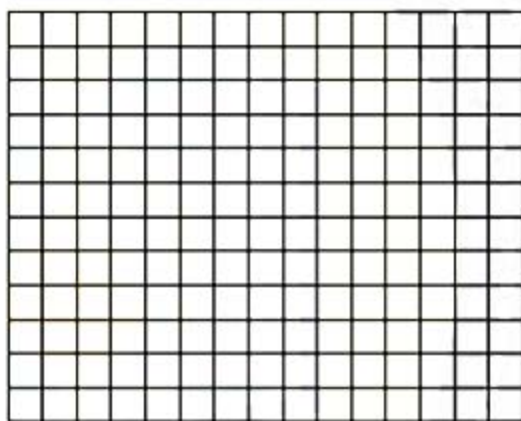
Day	Distance (in kilometers)
Saturday	$1\frac{1}{2}$
Sunday	2
Wednesday	1
Friday	$1\frac{1}{2}$



5 The following table represents the number of study hours of a group of students.

Represent the data using bar graphs, then answer:

Day	Distance (in kilometers)
Ahmed	$1\frac{1}{2}$
Mohamed	$2\frac{1}{4}$
Khadija	$1\frac{3}{4}$
Rahma	$1\frac{1}{2}$



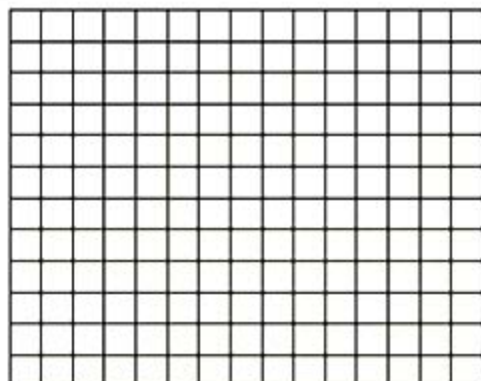
1 What is the difference between Mohammed's study hours and Khadija's study hours?

2 Which student studied the greatest number of hours?

6 The following table shows what Samah and Alaa saved in Egyptian pounds over 3 months.

Represent this data using double bar graphs.

Name	Alaa	Samah
Month		
First	30	10
Second	40	30
Third	50	50



Unit 12

Geometry



Lessons

1

Points, Lines, Rays and
Line Segments

2

Relationship between two
lines

3

✓ Symmetry
✓ Geometry in Our Lives

4

✓ Classifying Angles
✓ Drawing Angles

5

✓ Classifying Triangles
✓ Drawing Triangles

6

Classifying Quadrilaterals

Points, straight lines, and rays in geometry

Learn 1 plane surface, points, straight lines, rays, and line segments:

- **The Plane:** It is a two-dimensional surface that extends infinitely in all directions.

For example: a notebook page or the surface of a board — both are flat surfaces imagined extending infinitely in all directions.

- **A point:** a location on a plane's surface. **such as** point (A).



- **A straight line:** a line that extends infinitely in both directions, with no starting or ending point, **such as** line HG, represented symbolically by $\overleftrightarrow{HG}$.

The order doesn't matter when naming a straight line.

it can be read as $\overleftrightarrow{HG}$ or $\overleftrightarrow{GH}$.



- **A line segment:** a part of a straight line that has two endpoints, **such as** segment BC, represented symbolically $\overline{BC}$.

The order doesn't matter when naming a line segment:
it can be read as $\overline{CB}$ or $\overline{BC}$.

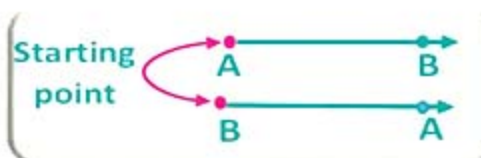


- **A ray:** a part of a line that has a starting point but no endpoint, it means extending infinitely in one direction only, **such as** ray DF, represented symbolically by $\overrightarrow{DF}$.

The order matters when naming a ray; it is read from the starting point to the other point.



- Ray AB, represented by the symbol $\overrightarrow{AB}$.
- Ray BA, represented by the symbol $\overrightarrow{BA}$.
- Ray AB is different from ray BA.



Note that:



- If a line segment extends infinitely from one of its ends, it forms a **ray**.
- If a line segment extends infinitely in both directions, it forms a **straight line**.
- The plane surface extends infinitely in all directions.
(Imagine a white sheet extending infinitely in all directions)
- Geometric shapes on a plane are two-dimensional, they have only two dimensions.
- Points and line segments are the parts that make up two-dimensional geometric shapes.



Example 1



Write what each of the following shapes represents:

1



2



3



Solution



1 Ray

2 Straight Line

3 Line Segment

Example 2



Write the mathematical symbol for each of the following shapes:

1



2



3



4



Solution

1 $\overrightarrow{AB}$ 2 $\overleftrightarrow{XY}$ 3 $\overline{CD}$ or $\overline{DC}$ 4 $\overleftrightarrow{HG}$ or $\overleftrightarrow{GH}$



Example 3



Draw the required shape using a ruler:

1 Line segment **LO**

2 ray **FG**

3 straight line **AB**

Solution



1



2



3



Example 4



Complete the following:

1 has a starting point and an ending point.

2 has a starting point but no endpoint.

3 The line segment AB is represented by the symbol

4 The given shape is represented by the symbol



Solution



1 Line segment

2 ray

3 $\overline{AB}$

4 $\overleftrightarrow{LM}$

Try by yourself



Write the name of each of the following shapes:

1



.....

2



.....

3



.....

Exercises on Points, straight lines, and rays in geometry



1 Choose the correct answer from the given options :

1 The given shape is called

- (A) straight line (B) ray (C) point (D) line segment

2 is a line that extends infinitely in both directions, having no starting or ending point.

- (A) Ray (B) Line segment (C) Straight line (D) Plane

3 is a part of a straight line that has a starting and an ending point.

- (A) Ray (B) Straight line (C) Line segment (D) Triangle

4 The given shape is called

- (A) $\overleftrightarrow{BA}$ (B) $\overrightarrow{AB}$ (C) $\overleftrightarrow{AB}$ (D) $\overrightarrow{AB}$



5 The given shape is called

- (A) $\overleftrightarrow{BA}$ (B) $\overrightarrow{AB}$ (C) $\overleftrightarrow{AB}$ (D) $\overrightarrow{AB}$



6 If a line segment extends infinitely in one direction, it forms

- (A) Straight line (B) Ray (C) Point (D) Line segment

7 The given shape is called

- (A) $\overrightarrow{BA}$ (B) $\overrightarrow{AB}$ (C) $\overleftrightarrow{AB}$ (D) $\overrightarrow{AB}$



8 Which of the following represents ray AB?

- (A)  (B)  (C)  (D) 

2 Complete the following:

- has a starting point and an ending point.
- Has a starting point but no endpoint.
- If a line segment extends infinitely in both directions, it forms
- In the given figure, the starting point is
- The given figure is called





- 6 The line segment AB is represented by the symbol
- 7 The straight line AB is represented by the symbol
- 8 The given shape is represented by the symbol
- 9 The line segment AB is represented by the symbol
- 10 is a part of a straight line that has a starting point but no endpoint.
- 11 In the given figure, the starting point is
- 12 The straight line AB is symbolized by



3 Match each shape with its name and corresponding symbolic expression:

1		☐	☐	The straight line YZ	☐	☐	
2		☐	☐	The line segment BC	☐	☐	
3		☐	☐	The straight line BC	☐	☐	
4		☐	☐	The ray BC	☐	☐	
5		☐	☐	The line segment YZ	☐	☐	
6		☐	☐	The ray YZ	☐	☐	

4 Write the mathematical symbol for each of the following shapes:

1



2



3



4



5



6



5 Draw the required shape using a ruler:

1 Line segment XY

2 Ray ST

3 Straight line GH

4 $\overleftrightarrow{NO}$

The relationship between the two lines

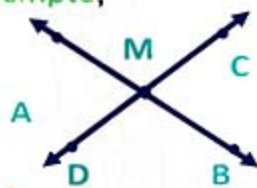
Learn



plane surface, points, straight lines, rays, and line segments:

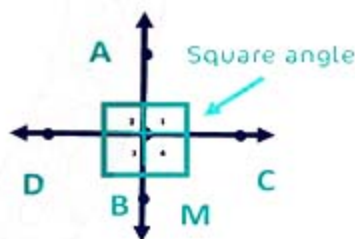
Intersecting lines:

- Two intersecting lines are lines that meet at one point, **for example**, straight lines **AB** and **CD** intersect at point **M**.
- If a line segment extends infinitely in both directions, it forms **a straight line**.
- The number of intersection points of two intersecting lines = **1**.



Perpendicular lines:

- Two perpendicular lines are lines that intersect at one point and form four right angles; **for example**, straight lines **AB** and **CD** intersect at point **M** and form 4 right angles.
- The number of intersection points of two perpendicular lines = **1**.
- All perpendicular lines are intersecting lines, but not all intersecting lines are perpendicular.



Parallel lines:

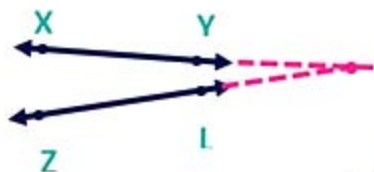
- Two parallel lines are lines that never intersect, no matter how far they extend, **for example**, straight lines **AB** and **CD** are parallel because they never meet.
- The number of intersection points of two parallel lines = **0**.
- A small arrow is drawn on each line to indicate that the two lines are parallel.



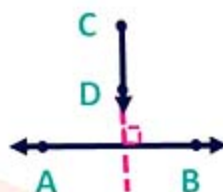
Note that:



- Sometimes we see only parts of pairs of straight lines or rays, and we need to extend them to determine whether they are intersecting or perpendicular, for example:



The straight lines XY and ZL are **intersecting**.



The straight line AB and the ray CD are **perpendicular**.

- We can extend a straight line in both directions and a ray in one direction, but we cannot extend a line segment in any direction.

Try by yourself



State the relationship between each pair of the following lines:

1



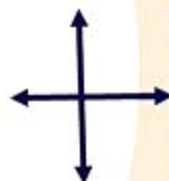
.....

2



.....

3



.....



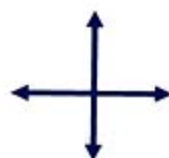
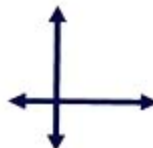
1 Choose the correct answer from the given options :

- 1 The figure  represents two straight lines that are
 (A) Parallel (B) Perpendicular (C) Intersecting (D) Other
- 2 The two never intersect.
 (A) straight lines (B) The parallel lines
 (C) The intersecting lines (D) Other
- 3 The given figure represents two lines that are

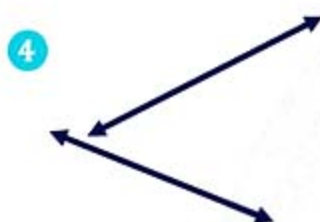
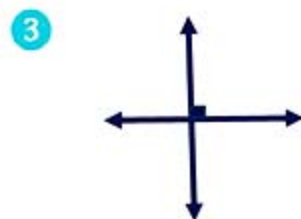
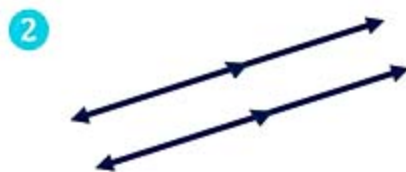
 (A) Intersecting (B) Parallel (C) Perpendicular (D) Coincident
- 4 Which of the following represents parallel lines?
 (A)  (B)  (C)  (D) 
- 5 All perpendicular lines are lines.
 (A) Intersecting (B) Parallel (C) Divergent (D) Other

2 Complete the following:

- 1 The two lines that never intersect are the lines.
- 2 The given figure represents two lines that are

- 3 The number of intersection points of parallel lines =
- 4 Two perpendicular lines produce right angles at their intersection.
- 5 The two lines that do not share any point are the lines.
- 6 The given figure represents two lines:

- 7 Two intersecting lines share
- 8 The two lines do not share any points.
- 9 Two perpendicular lines form 4 right angles.....
- 10 The given figure represents two lines:

- 11 Number of intersection points of intersecting lines =
- 12 Number of intersection points of parallel lines =

- 3 **Note:** For the drawn straight lines and rays, determine whether they are intersecting, parallel, or other (extend the lines and rays to confirm their relationship):



- 4 **Draw as required:**

- 1 Draw straight line **XY** parallel to straight line **AB**.



- 2 Draw line segment **XY** intersecting ray **AB**.



- 3 Draw line segment **LM** perpendicular to line segment **XY**.



- 4 Draw ray **PQ** that intersects the extension of ray **RS**.



- 5 Draw line segment **YZ** parallel to straight line **OM**.



- 6 Draw ray **LM** that intersects the extension of ray **AC**.





Symmetry and Geometry in our lives

Learn



Symmetry

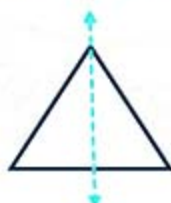
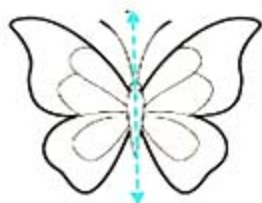
If we fold any geometric shape into two equal halves and get two identical, symmetrical parts, the line dividing the shape into these two halves is called the line of symmetry, and the shape is said to be symmetrical. **For example:**

Imagine folding the following shape along the drawn line.

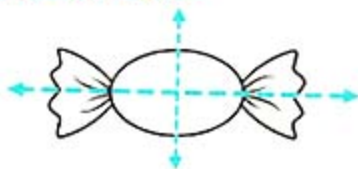
We will get two identical halves, and therefore the drawn line is the line of symmetry, and the shape is



➤ Some symmetrical shapes have **one line of symmetry**, for example:



➤ Some symmetrical shapes have **more than one line of symmetry**, for example:



➤ Shapes that are not symmetrical have **no lines of symmetry**, for example:



p

Example 1



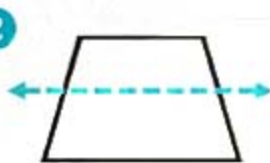
Determine whether the drawn line is a line of symmetry by putting (✓) if it is, or (X) if it is not:

1



()

2



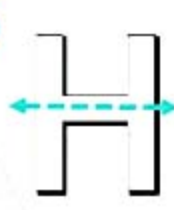
()

3



()

4



()

Solution



1 (✓)

2 (X)

3 (X)

4 (✓)

Example 2



Identify the symmetrical shapes below. (Write "Symmetrical" or "Not symmetrical")

1



2



3



4



Solution



1 (Not symmetrical)

2 (Symmetrical)

3 (Not symmetrical)

4 (symmetrical)



Example 3



Draw one line of symmetry for each of the following shapes, if any.

1



2

G

3



Solution



1



2

G

No lines of symmetry

3



Has other symmetry lines,

Try by yourself



Determine whether the drawn line is a line of symmetry for the shape.

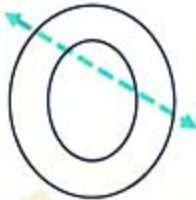
Write "Yes" or "No."

1



.....

2



.....

3



.....

4



.....

Note that:



Shape name	Shape	Number of lines of symmetry
Square		4
Rectangle		2
Circle		Infinite number
Parallelogram		Zero
Rhombus		2
Isosceles trapezoid		1

Try by yourself



Draw one or more lines of symmetry, if any, for the following shapes:

1



2



3



4



5





1 Choose the correct answer from the given options :

1 is a line that divides a shape into two exactly identical parts.

- (A) straight line (B) ray (C) line of symmetry (D) line segment

2 The shape that has a line of symmetry is



3 Which of the following letters has no line of symmetry?

- (A) W (B) A (C) M (D) F

4 The number of lines of symmetry in the symbol = K lines.

- (A) 1 (B) 2 (C) 3 (D) 0

5 Number of lines of symmetry of a square =

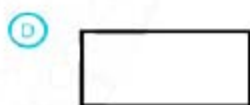
- (A) 1 (B) 2 (C) 3 (D) 4

6 Number of lines of symmetry of the shown figure =

- (A) 0 (B) 1 (C) 2 (D) 3



7 Which of the following shapes has no line of symmetry?



8 The number of lines of symmetry of the shown figure equals

- (A) 1 (B) 2 (C) 3 (D) 4



9 A basketball court is rectangular with sides 15m and 28m, its area equals . m^2

- (A) 24 (B) 42 (C) 420 (D) 240

10 A square swimming pool floor has side length 9 m; its perimeter equals ... m.

- (A) 18 (B) 23 (C) 36 (D) 32

11 A line of symmetry divides the shape when folded along it into parts that are

- (A) unequal (B) identical (C) different (D) other

- 12 A regular pentagonal window is surrounded by a frame of total length 450 cm: the side length of the window = cm.

(A) 90

(B) 9

(C) 45

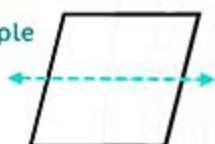
(D) 5

2 Complete:

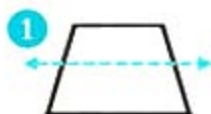
- is the line that divides a shape when folded into two exactly identical halves.
- Number of lines of symmetry of a rectangle =
- Number of lines of symmetry of a rhombus =
- Number of lines of symmetry of the shown figure = 

4 Determine whether the drawn line is a line of symmetry for the shape or not, as in the example:

Example



NO



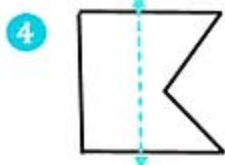
.....



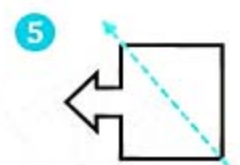
.....



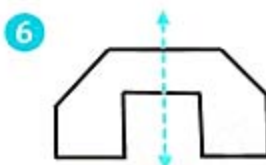
.....



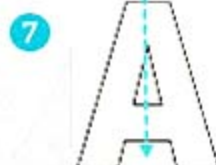
.....



.....



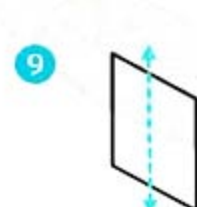
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.....

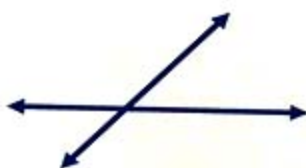
Classifying angles **and** drawing angles

Explore:

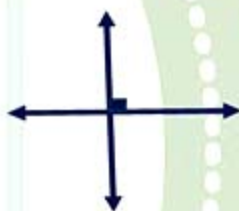
Complete the following using “intersecting and not perpendicular” – “perpendicular” – “parallel”:



The two lines are



The two lines are.....



The two lines are.....

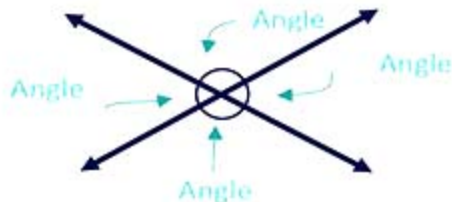
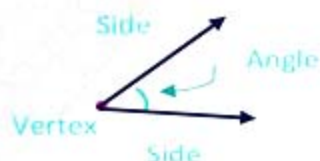
Learn



1 classifying angles:

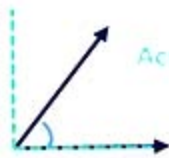
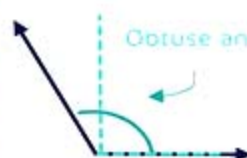
The angle:

- An angle is formed by the intersection of two rays that share the same starting point.
- The two rays are called **the sides (arms) of the angle**, and their common point is called the vertex of the angle.
- An angle can arise from the intersection of two-line segments or two straight lines, **for example**:



Classifying angles:

- The classification of an angle differs depending on the separation between the rays, as follows:

Right angle	Acute angle	Obtuse angle
 The square indicates the right angle	 Acute angle	 Obtuse angle
A right angle is formed when perpendicularity of two lines	smaller than a right angle	larger than a right angle

Right angles: are square angles formed by the perpendicular intersection of two straight lines, two-line segments, or two rays.

For example:



A right angle is formed by the intersection of two rays



A right angle is formed by the intersection of two-line segments



4 right angles are formed by the intersection of two perpendicular lines

Example 1



Determine the type of each of the following angles:

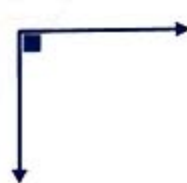
1



2



3



Solution



1



Acute angle

An acute angle because it is smaller than a right angle.

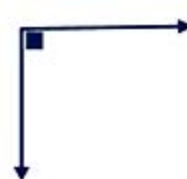
2



Acute angle

An acute angle because it is smaller than a right angle.

3



Right angle



Example 2



Identify the geometric shapes that contain right angles:



Shape (1)

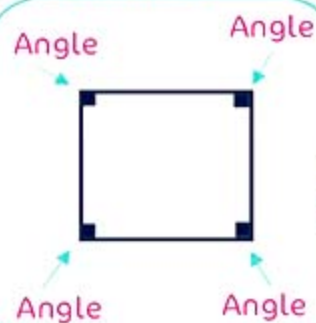


Shape (2)



Shape (3)

Note that:



Solution



The shapes that contain right angles are Shape (1) and Shape (3).

Example 3



In each of the following shapes: color the acute angles in blue, the right angles in red, and the obtuse angles in green.

1



2



3



Solution



1



2



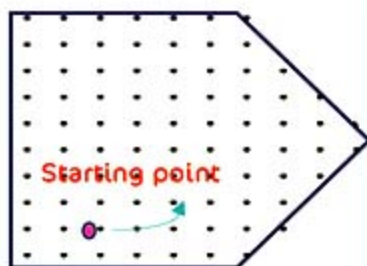
3



We can draw an acute angle on a dot grid by following these steps:

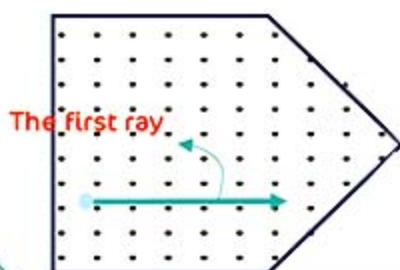
1

The starting point is determined



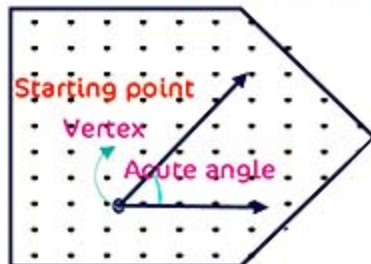
2

We connect the points using a ruler to draw the first ray



3

We connect the points using a ruler to draw the second ray from the same starting point.



Example 4



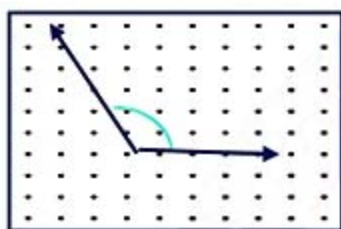
Draw using a ruler and a dot grid the following:

- 1 An obtuse angle.
- 2 Two right angles sharing the same starting point (vertex).
- 3 A triangle that contains one obtuse angle and two acute angles.

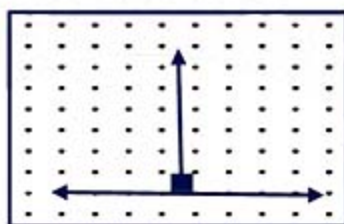
Solution



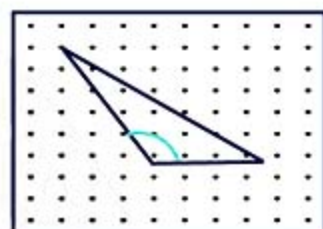
1



2



3

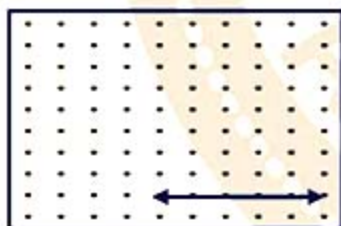


Try by yourself

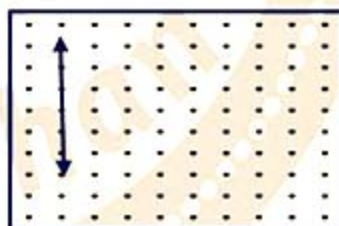


Complete the following drawings to obtain the required angle using a dot grid and a ruler:

1



2





1 Choose the correct answer from the given options :

1 The number of right angles in the shown figure is.....

- (A) 0 (B) 1 (C) 2 (D) 4



2 The angle larger than a right angle is a angle.

- (A) Acute (B) Right (C) Obtuse (D) None of the above

3 The angle smaller than a right angle is a angle.

- (A) Acute (B) Right (C) Obtuse (D) None of the above

4 The number of acute angles in the shown figure equals.....

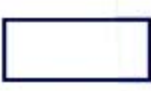
- (A) 1 (B) 2 (C) 3 (D) 0



5 Which of the following angles is an obtuse angle?.....

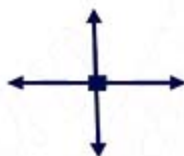
- (A)  (B)  (C)  (D) 

6 Which of the following shapes contains an obtuse angle?

- (A)  (B)  (C)  (D) 

7 The number of right angles in the shown figure equals.....

- (A) 0 (B) 1
(C) 3 (D) 4



8 The type of the angle in the shown figure is.....

- (A) Acute (B) Right
(C) Obtuse (D) Other



9 An angle smaller than a right angle is called a angle.

- (A) Acute (B) Right (C) Obtuse (D) None of the above

10 Which of the following angles is an acute angle.....

- (A)  (B)  (C)  (D) 

11 The obtuse angle the right angle.

- (A) Greater than (B) Less than (C) Equal to (D) Other

12 The shown figure represents a angle.

- (A) Straight (B) Right
(C) Obtuse (D) Acute



13 The angle is an angle larger than a right angle.

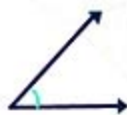
- (A) Acute (B) Right (C) Obtuse (D) None of the above

14 An acute angle the right angle.

- (A) Greater than (B) Less than (C) Equal to (D) Other

15 The type of the shown angle is.....

- (A) Right (B) Acute
(C) Obtuse (D) Straight



16 The angles resulting from the perpendicular intersection of two straight lines are

- (A) Acute (B) Right (C) Obtuse (D) Straight

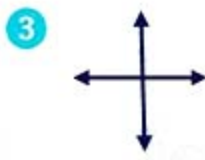
2 Place a (✓) under the lines that form right angles:



()



()

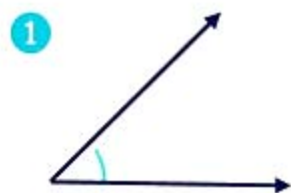


()



()

3 Write whether each angle is equal to, greater than, or less than a right angle:



.....



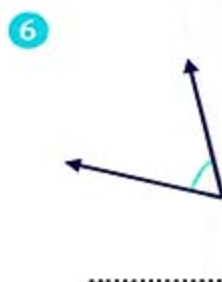
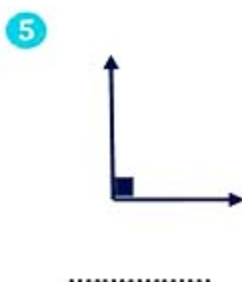
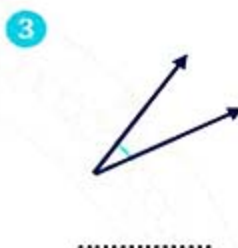
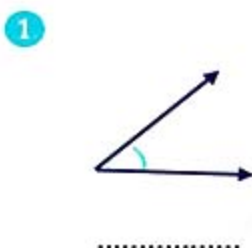
.....



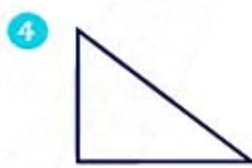
.....



4 Identify the type of each of the following angles:



5 Color acute angles red, right angles yellow, and obtuse angles blue:

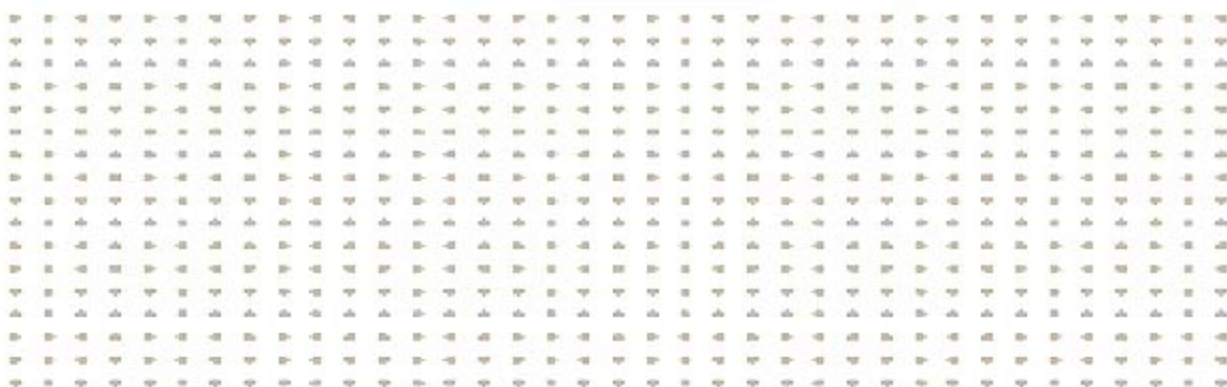


6 Use a ruler to draw the required angles on the grid:

1 An acute angle

2 An obtuse angle

3 A right angle





Classifying triangles and drawing triangles

Learn



Definition of a triangle:

A **triangle** is a geometric shape made of three sides (line segments) that meet at **three vertices** and form **three angles** between them.

- We can classify triangles according to their angle types or side lengths as follows:

First: Classification of triangles by angle types:

- The type of a triangle is determined by the types of its angles and by the measure of its largest angle as follows:

Acute-angled triangle:



A triangle all of whose angles are **acute**.

Right triangle:



A triangle that contains one **right** angle.

Obtuse triangle:



A triangle that contains one **obtuse** angle.

Second: Classification of triangles by side lengths:

- We can use a ruler to measure the side lengths of a triangle to determine its type by side lengths:

Scalene triangle:



It is a triangle in which all sides are **different** in length.

Isosceles triangle:



It is a triangle that has two **equal** sides in length.

Equilateral triangle:



It is a triangle in which all sides are **equal** in length.



Note that:



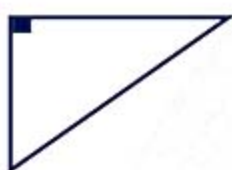
- In any triangle there are at least two acute angles.
- A triangle cannot contain two right angles or two obtuse angles.
- A triangle cannot contain a right angle and an obtuse angle simultaneously.
- A scalene triangle has no lines of symmetry.
- An isosceles triangle has one line of symmetry.
- An equilateral triangle has 3 lines of symmetry.

Example 1



Determine the types of the following triangles according to their angles:

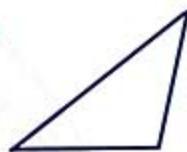
1



2



3



Solution



1 A right-angled triangle

2 An acute-angled triangle

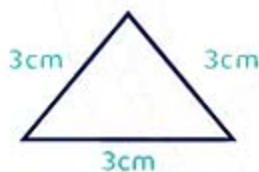
3 An obtuse-angled triangle

Example 2

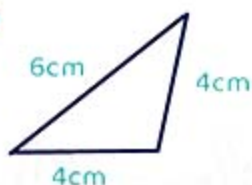


Identify the types of the following triangles according to their side lengths:

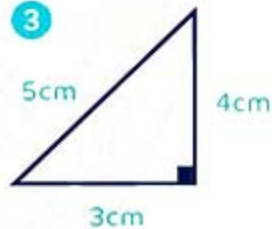
1



2



3



Solution



1 Equilateral triangle

2 Isosceles triangle

3 Scalene triangle

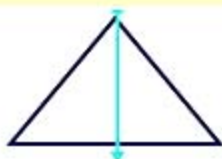
Some triangles have lines of symmetry and others do not.

Scalene triangle



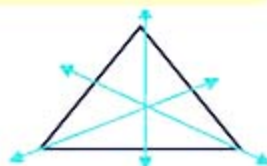
has no lines of symmetry

Isosceles triangle



has only one line of symmetry

Equilateral triangle



The triangle has 3 lines of symmetry

Try by yourself



Then complete by placing (acute-angled · obtuse-angled · right-angled):

1



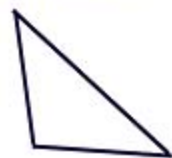
Triangle

2



Triangle

3



Triangle

Learn



2 triangle construction:

Equilateral triangle:

We draw all sides equal in length.

Isosceles triangle:

We draw two sides equal in length, and the third side is different.

Scalene triangle:

We draw all sides with different lengths.

Triangles can be formed according to their type

Acute triangle:

We draw a triangle with all three angles acute.

Right triangle:

We draw a triangle with one right angle and the other two angles

Obtuse triangle:

We draw a triangle with one obtuse angle and the other two angles acute.

Example 3



Draw as required:

1

Equilateral triangle

2

Acute-angled triangle

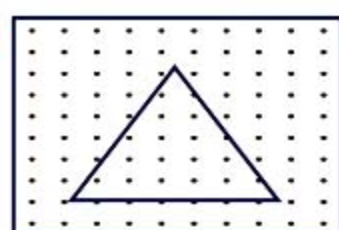
3

Scalene triangle

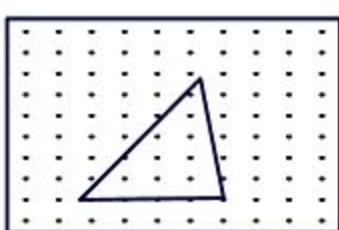
Solution



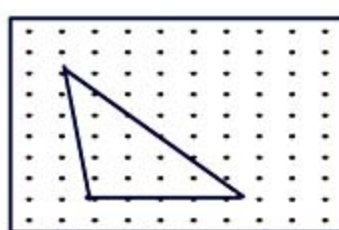
1



2



3



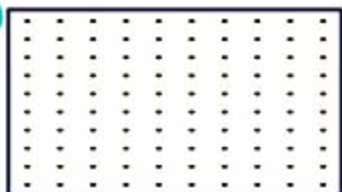


Try by yourself



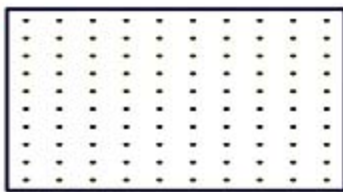
Draw as required:

1



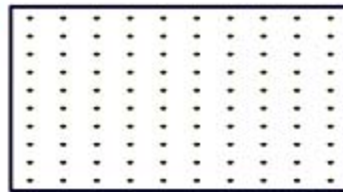
Acute-angled triangle

2



Scalene triangle

3



Obtuse-angled triangle



A Guide to Classifying Triangles

A triangle is a geometric shape with three sides and three angles, which can be categorized in two different ways.

BY ANGLE TYPES



Acute Triangle

All three angles are acute (less than 90°).



Right Triangle

Has one right angle (exactly 90°).



Obtuse Triangle

Has one obtuse angle (greater than 90°).

BY SIDE LENGTHS



Equilateral Triangle

All three sides are equal in length.



Isosceles Triangle

Has two sides of equal length.



Scalene Triangle

All three sides have different lengths.

LINES OF SYMMETRY



Equilateral: 3 Lines

An equilateral triangle has three lines of symmetry.



Isosceles: 1 Line

An isosceles triangle has one line of symmetry.



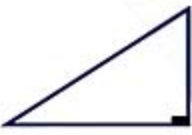
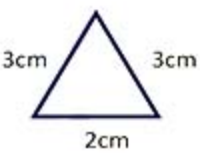
Scalene: No Lines

A scalene triangle has no lines of symmetry.

Exercises on Classifying triangles and drawing triangles



1 Choose the correct answer from the given options :

- 1 A triangle whose all angles are acute is a(n) triangle.
 (A) Acute (B) Right (C) Obtuse (D) Other
- 2 A triangle with side lengths 5cm, 5cm, 5cm is a... triangle (with respect to its side lengths)
 (A) Equilateral (B) Scalene (C) Isosceles (D) Right-angled
- 3 Number of sides of a triangle = sides.
 (A) 2 (B) 3 (C) 4 (D) 1
- 4 The shown triangle is a(n) triangle (by angle type).
 (A) Acute (B) Right (C) Obtuse (D) Isosceles
 
- 5 The triangle shown is a(n) triangle (with respect to its side lengths).
 (A) Equilateral (B) Isosceles (C) Right-angled (D) Scalene
 
- 6 Which of the following triangles is obtuse-angled?
 (A)  (B)  (C)  (D) 
- 7 In a right triangle, its largest angle is a(n)
 (A) Acute (B) Right (C) Obtuse (D) Straight
- 8 In an equilateral triangle, if two side lengths are 4 cm, 4 cm, then the third side length equals cm.
 (A) 5 (B) 2 (C) 3 (D) 4
- 9 The type of the shown triangle by its angle measures is a(n) triangle.
 (A) Acute-angled (B) Obtuse-angled (C) Right-angled (D) Equilateral
 
- 10 A triangle whose all sides are equal in length is called a(n) triangle.
 (A) Right-angled (B) Isosceles (C) Scalene (D) Equilateral



- 11 An obtuse triangle contains acute angle(s).
(A) 1 (B) 2 (C) 3 (D) 4
- 12 A triangle that has a right angle is called a(n) triangle.
(A) Acute-angled (B) Right-angled
(C) Obtuse-angled (D) Scalene
- 13 A triangle whose all sides are different in length is called a(n) triangle.
(A) Equilateral (B) Scalene (C) Isosceles (D) Other
- 14 Number of right angles in an acute-angled triangle =
(A) 0 (B) 1 (C) 2 (D) 3
- 15 From the shown figure: the triangle type by its angles is
(A) Acute-angled (B) Right-angled
(C) Isosceles (D) Obtuse-angled

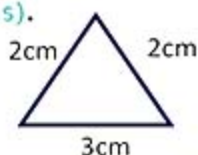


2 Complete the following:

- 1 A triangle whose side lengths are 3 cm, 3 cm, 3 cm is a triangle. (According to the lengths of its sides)
- 2 A triangle whose side lengths are 7 cm, 4 cm, 5 cm is a triangle. (According to the lengths of its sides)
- 3 If a triangle's largest angle is a right angle, then it is a triangle (by angle types).
- 4 If a triangle's largest angle is an obtuse angle, then it is a triangle (by angle types).
- 5 The shown triangle is a triangle (by its angle types).



- 6 The shown triangle is a triangle (by its side lengths).



- 7 A polygon with three sides and three angles is called a(n)
- 8 A triangle that has two equal side lengths is called a(n) triangle.

- 9 If the largest angle of a triangle is an acute angle, then it is a(n) triangle.
- 10 The number of acute angles in an equilateral triangle =
- 11 An equilateral triangle is a(n) triangle (by its angles).
- 12 The number of acute angles in a right triangle =

3 Classify the following triangles according to their angle types:

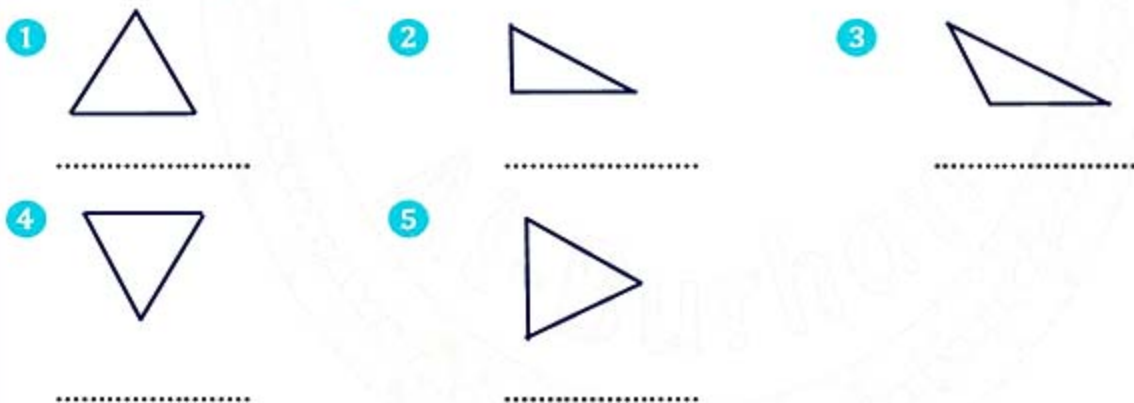


4 Classify the following triangles according to their angle types:

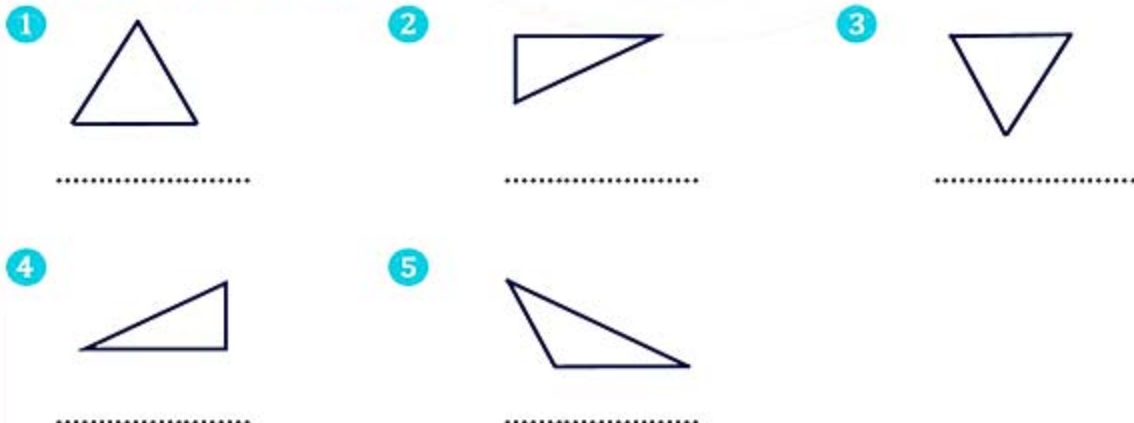


5 Circle as required in each of the following:

1 Acute-angled triangles:



2 Right-angled triangles:





5 Obtuse-angled triangles:



.....



.....



.....

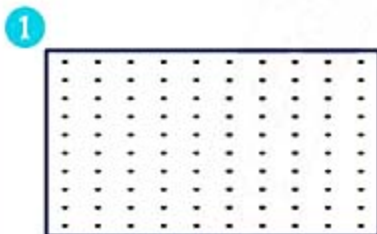


.....

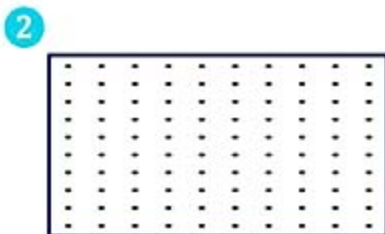


.....

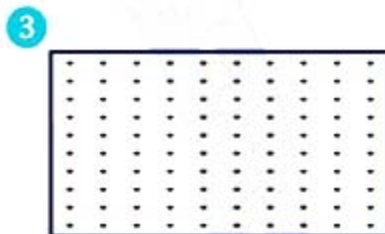
6 Draw as required using a dot grid and a ruler:



Equilateral triangle



Isosceles triangle



Scalene triangle

7 Write the classification of each of the following triangles:



➤ Type of triangle by side lengths:

➤ Type of triangle by its angles:



➤ Type of triangle by side lengths:

➤ Type of triangle by its angles:



➤ Type of triangle by side lengths:

➤ Type of triangle by its angles:



➤ Type of triangle by side lengths:

➤ Type of triangle by its angles:

Classification of quadrilaterals

Learn



Classification of quadrilaterals

1 Square

➤ It has:

- Two pairs of parallel sides.
- All sides are equal in length.
- 4 right angles.



2 The given shape:

- It is a quadrilateral. It has 4 sides and 4 angles, and it is called a quadrilateral.
- Quadrilaterals that have at least one pair of parallel sides can be classified further with new names, as follows:



3 Rectangle:

➤ It has:

- Two pairs of parallel sides, and opposite sides are equal in length.
- 4 right angles.



6 Rhombus:

➤ It has

- Two pairs of parallel sides.
- All sides are equal in length.
- Opposite angles are equal in measure (congruent).



5 Trapezoid:

➤ It has:

- Only one pair of parallel sides.
- Four angles that have different measures.



4 Parallelogram:

➤ It has:

- Two pairs of parallel sides.
- It has four angles: two acute angles and two obtuse angles.
- Opposite angles are equal in measure.





Note that:



- A parallelogram and a rhombus each contain two acute angles and two obtuse angles, and their opposite angles are equal.
- Some trapezoids have equal-angle pairs while others have no equal angles.
- Both the parallelogram and the rhombus have two pairs of opposite parallel sides and do not have right angles, whereas the square and the rectangle have two pairs of opposite parallel sides and 4 right angles.



Example 1



Write the name of each of the following shapes:

1



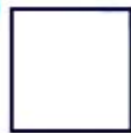
.....

2



.....

3



.....

4



.....

Solution



1 Parallelogram

2 Trapezoid

3 Square

4 Rectangle

Example 2



Who am I?

- 1 A quadrilateral with all sides equal in length and four right angles.
- 2 A quadrilateral that has only one pair of parallel sides.
- 3 A quadrilateral with all sides equal in length and two acute angles and two obtuse angles.
- 4 A quadrilateral whose opposite sides are equal in length and that has four right angles.

Solution



1 Square

2 Trapezoid

3 Rhombus

4 Rectangle

Exercises on

Classification of quadrilaterals



1 Choose the correct answer from the given options :

1 The quadrilateral that has 4 equal sides is

- (A) Trapezoid (B) Rhombus (C) Rectangle (D) Triangle

2 The number of right angles in the shown quadrilateral equals

- (A) 1 (B) 2
(C) 0 (D) 4



3 The quadrilateral that has two pairs of parallel sides and equal opposite angles is

- (A) Parallelogram (B) Trapezoid (C) Right triangle (D) Pentagon

4 The geometric shape that has 4 angles and 4 vertices is called a(n)

- (A) Triangle (B) Pentagon (C) Hexagon (D) Quadrilateral

5 The number of pairs of parallel sides in the rectangle equals

- (A) 1 (B) 2 (C) 3 (D) 4

6 In the shown figure side XY is parallel to side

- (A) LZ (B) YZ
(C) XL (D) LY



7 The number of right angles in the square = angles.

- (A) 3 (B) 2 (C) 1 (D) 4

8 The quadrilateral that has only one pair of parallel sides is

- (A) Parallelogram (B) Square (C) Trapezoid (D) Rhombus

9 The quadrilateral with all sides equal in length and two acute angles and two obtuse angles is

- (A) Square (B) Rhombus (C) Trapezoid (D) Rectangle

10 The quadrilateral that has two pairs of parallel sides and all right angles is called a(n)

- (A) Rhombus (B) Parallelogram (C) Trapezoid (D) Rectangle

11 The quadrilateral with all sides equals in length is

- (A) Parallelogram (B) Rectangle (C) Trapezoid (D) Square



2 Complete the following:

- 1 A square has all its angles
- 2 The number of sides of a quadrilateral = sides.
- 3 The quadrilateral that has 4 right angles and opposite sides equal in length is a
- 4 Among quadrilaterals that have two pairs of parallel sides and all sides equal in length are ,
- 5 The quadrilateral with all sides equal in length and four right angles is
- 6 Among quadrilaterals that have two acute angles and two obtuse angles are ,
- 7 The rhombus has two acute angles and two angles.
- 8 Quadrilaterals whose all angles are congruent include ,
- 9 The quadrilateral that has only one pair of parallel sides is
- 10 The number of right angles in a rectangle equals angles.
- 11 In the shown parallelogram, the number of right angles equals 
- 12 The quadrilateral that has two pairs of parallel sides, opposite sides equal in length, and all right angles is
- 13 The number of right angles in a rhombus equals
- 14 A quadrilateral has vertices, sides, and angles.
- 15 The number of right angles in a square equals angles.
- 16 The geometric shape  is called
- 17 The quadrilateral with all sides equal in length and four right angles is
- 18 The number of right angles in a rectangle = angles.

3 Who am I:

- 1 A quadrilateral with two acute angles and two obtuse angles and all sides equal in length. (.....)

- 2 A quadrilateral with 4 right angles and two pairs of equal-length sides.
(.....)
- 3 A quadrilateral with only one pair of parallel sides. (.....)
- 4 A quadrilateral with all sides equal in length. (.....)
- 5 A quadrilateral with 4 right angles and 4 equal sides. (.....)

4 Write the name of each of the following geometric shapes:

1



.....

2



.....

3



.....

4



.....

5 Match each shape with its appropriate property:

1



.....



Its angles are right angles, and all its sides are equal in length.

2



.....



It has only one pair of parallel sides.

3



.....



Its angles are right angles, and its opposite sides are equal in length.

4



.....



ts sides are equal in length, and it has no right angles.

Unit 13

Angles and the Circle



Lessons

1

The Circle and Angle Measurements

2

Angle Measurements using a Circle Model

3

✓ Using a Protractor
✓ Measuring Angles

4

✓ Drawing Angles
✓ Drawing Angles using a Protractor

5

Classifying Triangles using Geometric Tools



The Circle and Angle Measurements

Learn

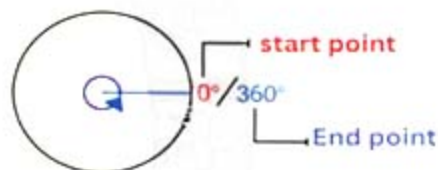


The Circle and Angle Measurements

➤ An angle is measured in a unit called a **degree ($^{\circ}$)**, and it is represented by a small circle placed above and to the right of the number that shows the measure of the angle. For example, the measure of an angle of 30 degrees is written as **30°**

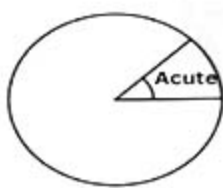
➤ When measuring any angle, we always start from **0°**

➤ Every circle, whether large or small, contains **360°**



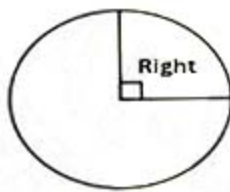
We can classify the angles inside the circle as follows:

Acute angle



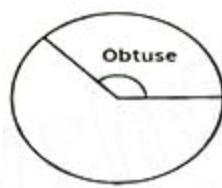
Its measure is
greater than 0°
and **less than 90°**

Right angle



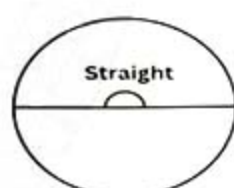
Its measure is
equal to 90°

Obtuse angle



Its measure is
greater than 90°
and less than
 180°

Straight angle



Its measure is
equal to 180°

Note that:



➤ The measure of a straight angle equals the sum of the measures of two right angles.

➤ The measure of an acute angle $<$ the measure of a right angle $<$ the measure of an obtuse angle $<$ the measure of a straight angle.

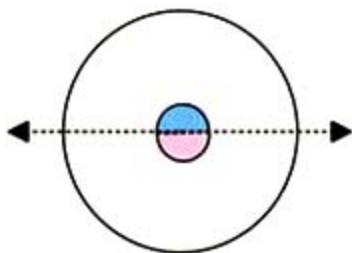
0° Acute angle 90° Obtuse angle 180°



Note that:

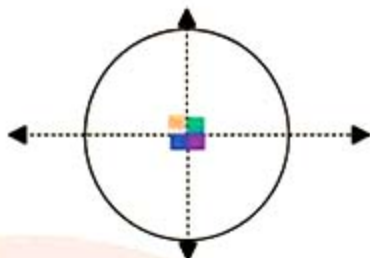


- A complete circle can be divided into **4 right angles** or **2 straight angles**, therefore:



The straight angle represents

$\frac{1}{2}$ of a circle



The right angle represents

$\frac{1}{4}$ of a circle

Note that:



- The starting point of forming an angle (0°) can be placed **at any point on the circle**
- There are **two directions** that can be used to determine the position of angles on the circle.
- A full circle contains 360° that is **4 right angles**, whether the circle is small or large.
- The geometric shape produced by a **full rotation** is a **circle of 360°** .
- The geometric shape produced by a **half rotation** is a **semicircle of 180°** .



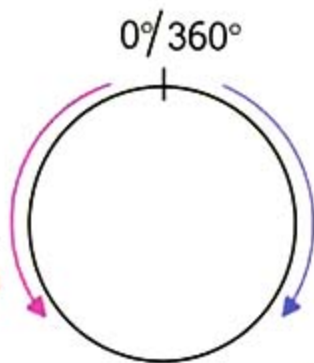
start point
 $0^\circ/360^\circ$
End point

Learn



2 Directions of Angle Measurement on the Circle

- ✓ To draw any angle on a circle, there are **two directions** that can be used, as shown below:
- ✓ The starting point (0°) can be placed on any point of the circle.
- ✓ A complete movement around the circle forms an angle of 360°



Example 1

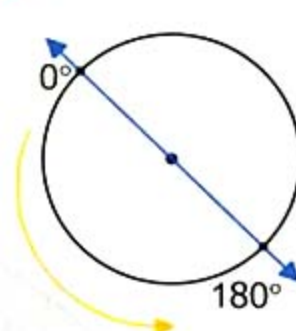
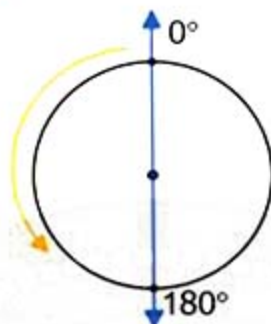
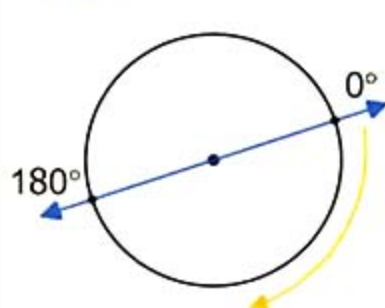


Draw an angle starting from 0° in the direction specified as required.

1 Acute angle

2 Obtuse angle

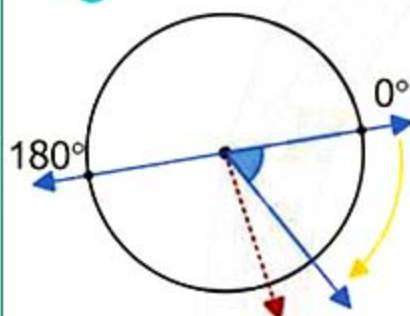
3 Right angle



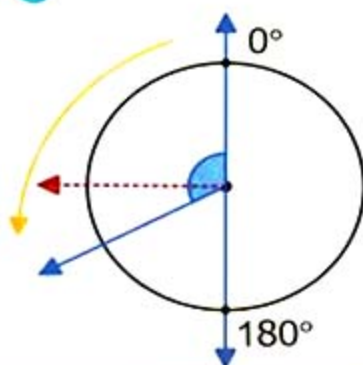
Solution



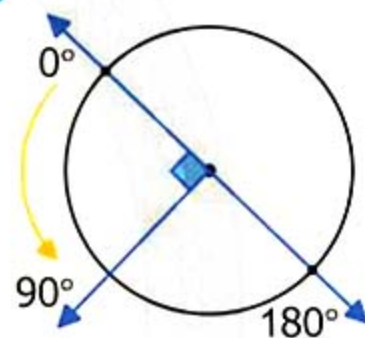
1



2



3



Try by yourself



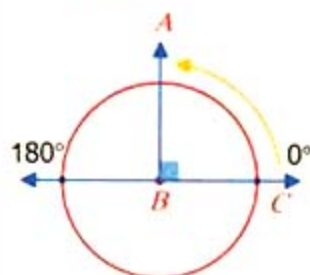
1 On the circle, starting from 0° , draw an angle of 180° in the specified direction.

2 Write the type of each shaded and drawn angle with the given direction, as shown in the example:



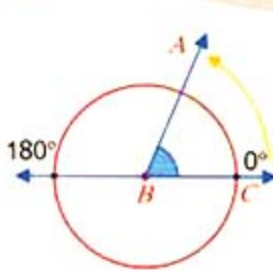
Example :

1



Angle type : **Right angle**

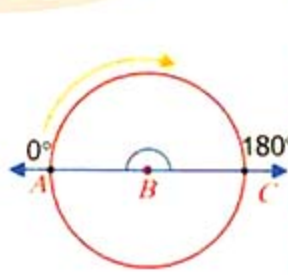
2



Angle type :

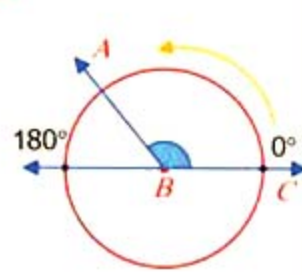
.....

3



Angle type :

.....



Angle type :

.....

Exercises on The Circle and Angle Measurements



1 Choose the correct answer from the given options :

- 1 The number of degrees in a circle =
 (A) 60° (B) 360° (C) 180° (D) 30°
- 2 The measure of right angles the measure of a straight angle.
 (A) $>$ (B) $<$ (C) $=$ (D) otherwise
- 3 An angle that measures 50° is called a(n).....
 (A) Acute angle (B) Right angle (C) Obtuse angle (D) Straight angle
- 4 Which of the following represents an acute angle?
 (A) 45° (B) 90° (C) 94° (D) 180°
- 5 Angles are measured in the unit called.....
 (A) cm (B) m (C) l (D) degree
- 6 An angle whose measure is greater than 90° and less than 180°
 (A) Acute (B) Right (C) Obtuse (D) Straight
- 7 If you divide a circle into 4 equal parts, each part represents a(n).....
 (A) Acute (B) Right (C) Obtuse (D) Straight
- 8 An obtuse angle measures greater than.....
 (A) 0° (B) 90° (C) 180° (D) 110°
- 9 An acute angle measures less than 90° and greater than.....
 (A) 0° (B) 90° (C) 180° (D) 270°
- 10 The angle shown in the figure equals
 (A) 90° (B) 180° (C) 270° (D) 360°
- 11 The measure of an acute angle The measure of an right angle.
 (A) $<$ (B) $>$ (C) $=$ (D) $\leq$



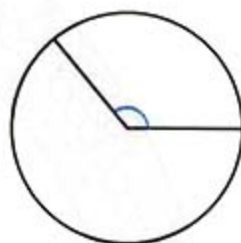
2 Complete the Following:

- 1 The angle that measures 150° is an.....
- 2 The angle that measures $=$ 90°
- 3 The measure of a straight angle =

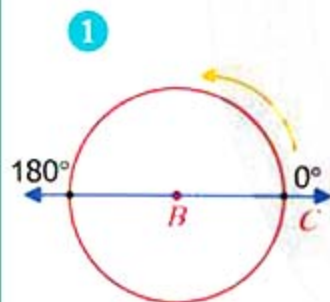
- 4 The angle that represents $\frac{1}{2}$ of a circle is a.....
- 5 The angle that represents $\frac{1}{4}$ of a circle is a.....
- 6 The angle whose measure is greater than a right angle and less than a straight angle is.....
- 7 The angle whose measure is greater than 0° and less than 90° is.....
- 8 The angle whose measure equals the sum of two right angles is.....

3 Answer the following :

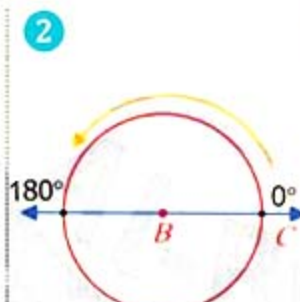
What type of angle is the opposite angle?



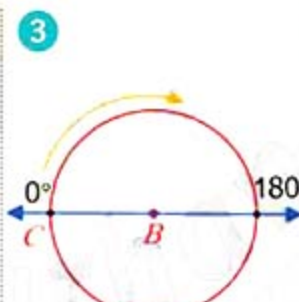
4 Draw the other ray that completes each angle to obtain the required angle, with the vertex at point B and the direction as indicated



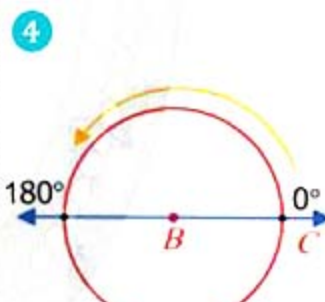
Right angle



straight angle



Obtuse angle



Acute angle



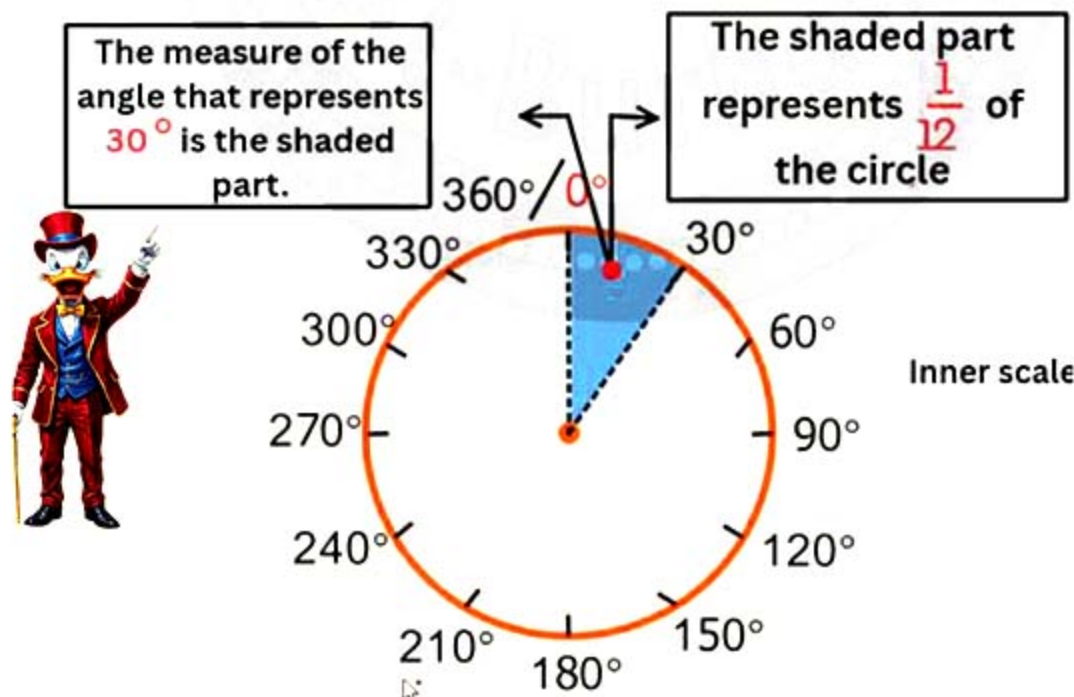
Measuring angles using a circle model

Learn



Exploring Angles:

- A **circle model** is divided into **12** equal parts, where each part represents $\frac{1}{12}$ of the whole model
- The total number of degrees in a circle model = 360°
- Each part of the model represents an angle of = 30° (because: $360 \div 12 = 30$)
- When using a circle model, we can place the 0° at any position on the circle.



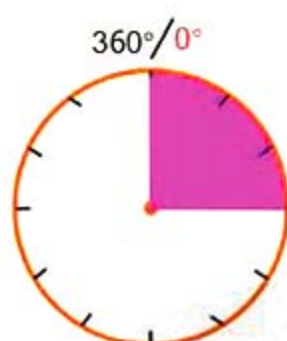
Learn



The Relationship Between Fractions and Angle Measures in the Circle Model:



- fraction : $\frac{4}{12} = \frac{1}{3}$
➤ Measure = 120°



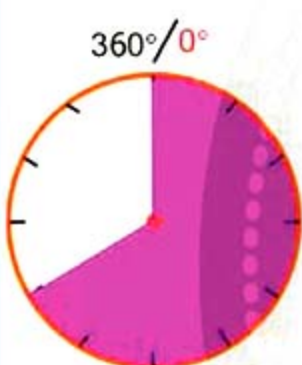
- fraction : $\frac{3}{12} = \frac{1}{4}$
➤ Measure = 90°



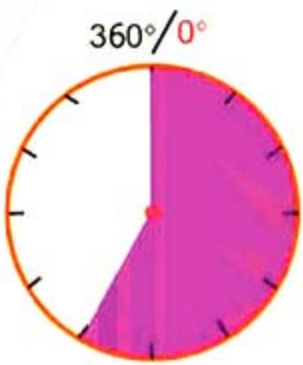
- fraction $\frac{2}{12} = \frac{1}{6}$
➤ Measure = 60°



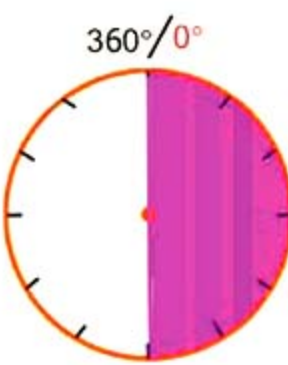
- fraction : $\frac{1}{12}$
➤ Measure = 30°



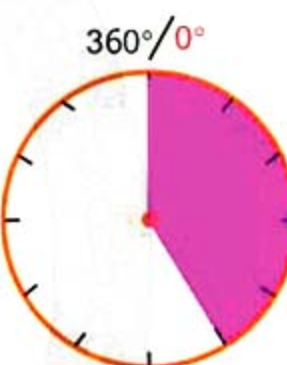
- fraction : $\frac{8}{12} = \frac{2}{3}$
➤ Measure = 240°



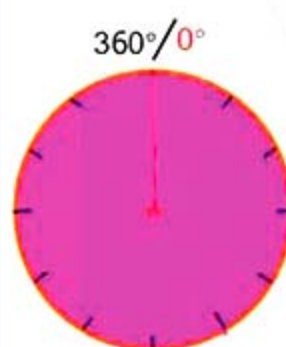
- fraction : $\frac{7}{12}$
➤ Measure = 210°



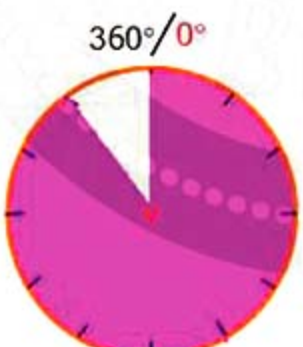
- fraction $\frac{6}{12} = \frac{1}{2}$
➤ Measure = 180°



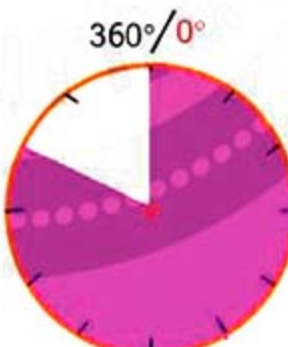
- fraction $\frac{5}{12}$
➤ Measure = 150°



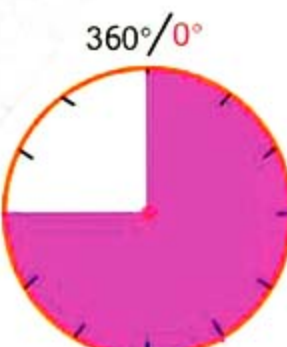
- fraction : $\frac{12}{12} = 1$
➤ Measure = 360°



- fraction : $\frac{11}{12}$
➤ Measure = 330°



- fraction $\frac{10}{12} = \frac{5}{6}$
➤ Measure = 300°



- fraction : $\frac{9}{12} = \frac{3}{4}$
➤ Measure = 270°



Note that:

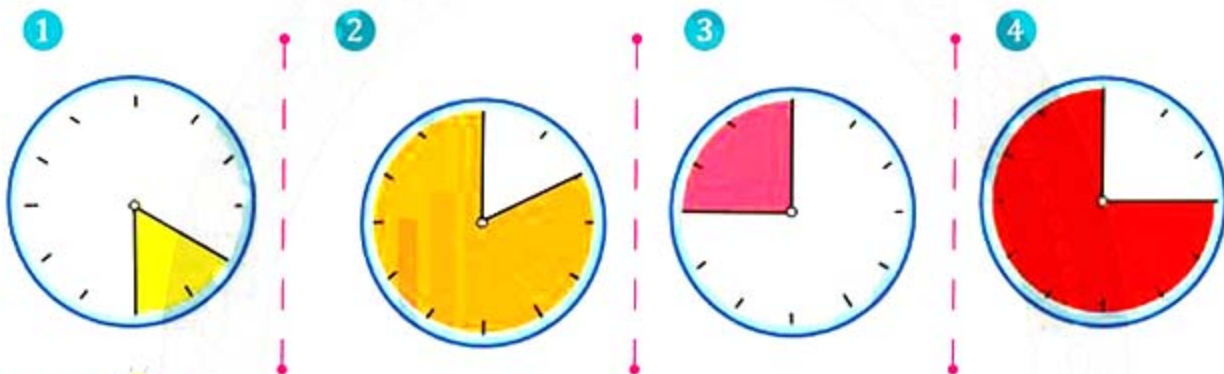


- The angle formed between the two hands of a clock when the time is exactly 3 o'clock measures 90°
- The angle shown on the circle model when the time is exactly 6 o'clock is a straight angle.

Example 1



Write the fraction that represents the shaded part in each model, and find the measure of the angle it represents.:



Solution



1 fraction : $\frac{2}{12}$

Angle measure : $30^\circ \times 2 = 60^\circ$

2 fraction : $\frac{10}{12}$

Angle measure : $30^\circ \times 10 = 300^\circ$

3 fraction : $\frac{3}{12}$

Angle measure : $30^\circ \times 3 = 90^\circ$

4 fraction : $\frac{9}{12}$

Angle measure : $30^\circ \times 9 = 270^\circ$

Example 2



Represent the following fractions on circle models, then write the measure of the angle represented by each fraction.:

1 $\frac{2}{12}$



2 $\frac{2}{3}$



Solution



1



fraction $\frac{2}{12}$ represent 60°

2



fraction $\frac{2}{3}$ represent 240°

Example 3



Write the measure of the angle represented by each of the following fractions in the circle model:

1 $\frac{4}{12}$ represent.....

2 $\frac{2}{12}$ represent.....

3 $\frac{3}{4}$ represent.....

4 $\frac{1}{2}$ represent.....

Solution



1 $\frac{4}{12}$ represent 120°

Because : $30^\circ \times 4 = 120^\circ$

2 $\frac{2}{12}$ represent 60°

Because : $30^\circ \times 2 = 60^\circ$

3 $\frac{3}{4}$ represent 270°

Because : $30^\circ \times 9 = 270^\circ \leftarrow \frac{3}{4} = \frac{9}{12}$

4 $\frac{1}{2}$ represent 180°

Because : $360^\circ \times \frac{1}{2} = 180^\circ$

Exercises on Measuring angles using a circle model



1 Choose the correct answer from the given options :

- 1 Which of the following models represents the fraction $\frac{1}{12}$?



- 2 The measure of the angle representing $\frac{1}{4}$ of the circle model equals.....

(A) 80° (B) 100° (C) 180° (D) 90°

- 3 The measure of the angle representing $\frac{1}{6}$ of the circle model equals.....

(A) 60° (B) 300° (C) 330° (D) 150°

- 4 The type of angle representing $\frac{1}{3}$ of the circle model is.....

(A) Right (B) acute (C) obtuse (D) straight

- 5 When a circle is divided into 12 equal parts, the measure of the angle for one part is

(A) 30° (B) 90° (C) 180° (D) 360°

- 6 The total number of degrees in a circle model equals.....

(A) 30° (B) 90° (C) 180° (D) 360°

- 7 The angle that measures 240° represent..... what fraction of the circle model.

(A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) $\frac{2}{3}$ (D) $\frac{1}{6}$

- 8 The fraction $\frac{1}{2}$ in the circle model represents a(n).....

(A) Right (B) acute (C) obtuse (D) straight

- 9 The fraction $\frac{1}{12}$ represents an angle of.....

(A) 30° (B) 50° (C) 60° (D) 330°

- 10 The fraction $\frac{1}{4}$ in the circle model represents a(n).....

(A) Right (B) acute (C) obtuse (D) straight

- 11 The fraction $\frac{2}{12}$ in the circle model represents an angle that measures.....
- (A) 30° (B) 60° (C) 90° (D) 120°
- 12 The measure of the angle representing $\frac{1}{6}$ of the circle model=.....
- (A) 30° (B) 60° (C) 90° (D) 360°
- 13 The angle that measures 120° represents..... what fraction of the circle model.
- (A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) $\frac{1}{4}$ (D) $\frac{1}{5}$

2 Complete the Following:

- 1 The measure of the angle representing $\frac{10}{12}$ of the circle model.....degree
- 2 The fraction $\frac{1}{4}$ represents an angle of.....degree
- 3 The measure of the shaded part in the model=
- 4 The measure of the angle representing $\frac{1}{3}$ of the circle model=.....



3 Write the fraction that represents the shaded part in each model in its simplest form, and find the angle measure it represents.:

- | | | | |
|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| 1 | 2 | 3 | 4 |
| | | | |
| > Fraction= $\frac{\dots}{\dots}$ | > Fraction= $\frac{\dots}{\dots}$ | > Fraction= $\frac{\dots}{\dots}$ | > Fraction= $\frac{\dots}{\dots}$ |
| > Angle measure= ... | > Angle measure= ... | > Angle measure= ... | > Angle measure= ... |
| 5 | 6 | 7 | 8 |
| | | | |
| > Fraction= $\frac{\dots}{\dots}$ | > Fraction= $\frac{\dots}{\dots}$ | > Fraction= $\frac{\dots}{\dots}$ | > Fraction= $\frac{\dots}{\dots}$ |
| > Angle measure= ... | > Angle measure= ... | > Angle measure= ... | > Angle measure= ... |



4 Use the Following Models Represent the given angles, then write the fraction that represents each angle in simplest form:

1 90°



.....

.....

2 270°



.....

.....

3 210°



.....

.....

5 Write the Angle Measure for Each Fraction:

1 The measure of the angle represented by the fraction $\frac{2}{3}$ =

2 The measure of the angle represented by the fraction $\frac{3}{4}$ = $^\circ$

3 The measure of the angle represented by the fraction $\frac{1}{6}$ = $^\circ$

4 The measure of the angle represented by the fraction $\frac{1}{2}$ = $^\circ$

Using a protractor and measuring angles

Learn



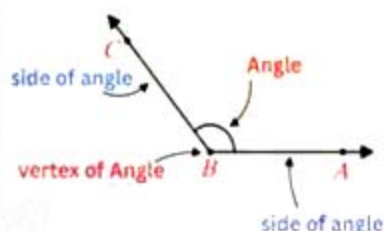
Naming Angles:

An angle: is formed by two rays (sharing a common starting point).

Vertex of the angle : The point where the two rays intersect .

Parts of an Angle:

The vertex of the angle (*the intersection point of the two rays*) is the point B



Rays : $\vec{BA}$, $\vec{BC}$
are called the sides of the angle..

Determine the vertex and the sides of each angle, then write **three different names** for each:

Vertex CBA

Angle names $\angle CBA$

Vertex ABC

Angle names $\angle ABC$

Vertex B

Angle names $\angle B$

Note that:



- The symbol for an angle is $\angle$
- When naming an angle using three points, the **vertex** is always written in the middle

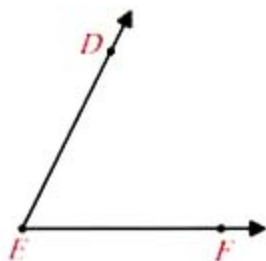


Example 1

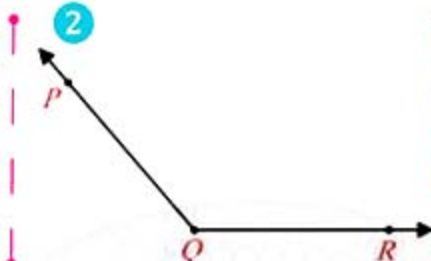


Determine the vertex and the sides of each angle, then write three different names for each:

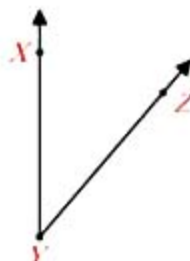
1



2



3



Solution

1 Vertex: E

Sides: $\overrightarrow{EF}$, $\overrightarrow{ED}$

Angle names: $\angle E$ or $\angle DEF$ or $\angle FED$

2 Vertex: Q

Sides: $\overrightarrow{QR}$, $\overrightarrow{QP}$

Angle names: $\angle Q$ or $\angle PQR$ or $\angle RQP$

3 Vertex: Y

Sides: $\overrightarrow{YX}$, $\overrightarrow{YZ}$

Angle names: $\angle Y$ or $\angle XYZ$ or $\angle ZYX$

Learn



Measuring Angles Using the Protractor:

A protractor is a tool used to measure and draw angles. It is shaped like a half circle, and it is divided into small equal parts called **degrees (°)**. The protractor contains 180 degrees (°).

- A protractor is used to measure angles from 0° to 180°
- There are **two scales** on a protractor. Each scale starts from 0° on one side and ends at 180° on the other side.

Outer scale



Each mark represents one degree.

Inner scale

Center of the protractor

Zero line

Steps for Measuring an Angle Using the Protractor:

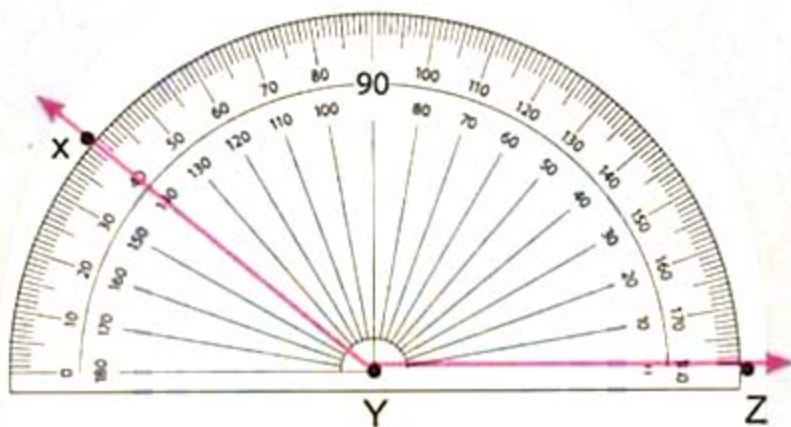
To measure $\angle XYZ$, follow these steps:

1. Place the center point of the protractor at the vertex (Y) of the angle
2. Align the zero line of the protractor with one side of the angle, for example $\overrightarrow{YZ}$
3. Look at where the other side $\overrightarrow{YX}$ crosses the scale of the protractor..

If the ray $\overrightarrow{YX}$ crosses the scale at 40° , then the angle measures 140°

4. If the angle is acute, use the smaller number ($< 90^\circ$).

If the angle is obtuse, use the larger number ($> 90^\circ$)

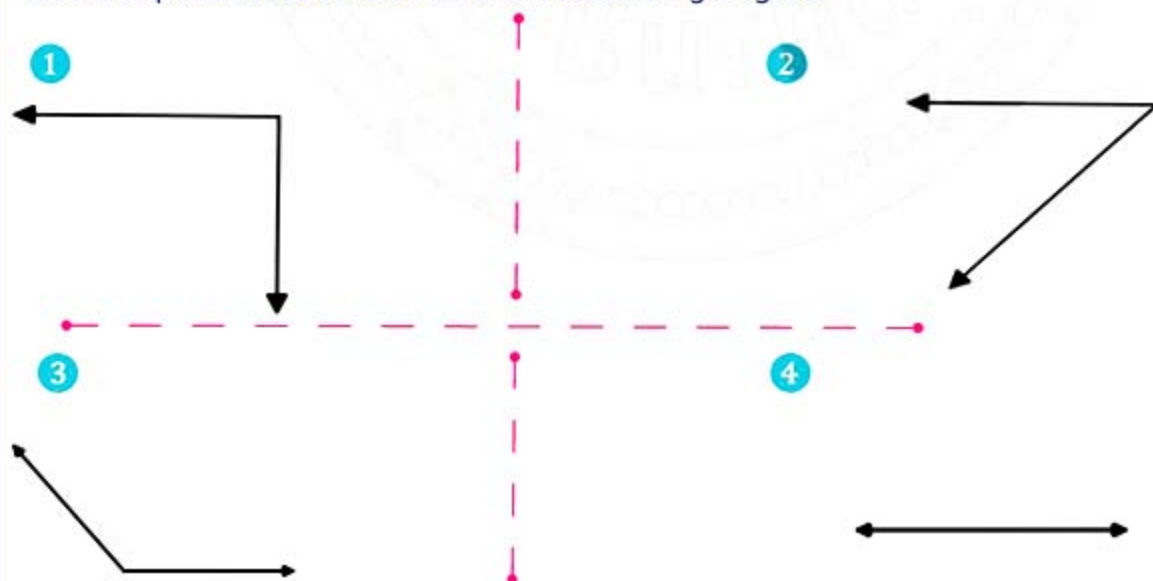


Thus, $\angle XYZ = 140^\circ$, which means it is an obtuse angle.

Example 1



Use the protractor to measure the following angles:

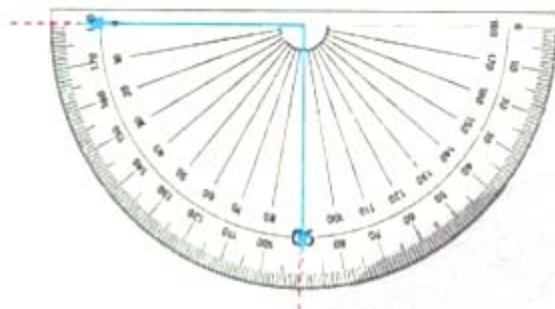




Solution

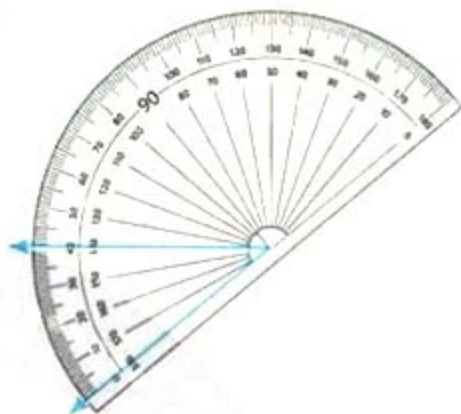


1



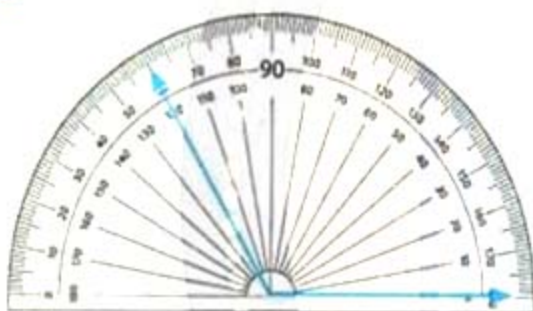
Angle = 90°

2



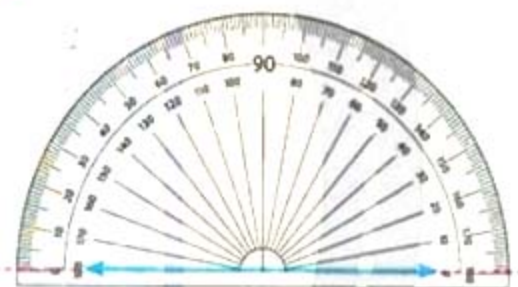
Angle = 40°

3



Angle = 120°

4



Angle = 180°

Note that:



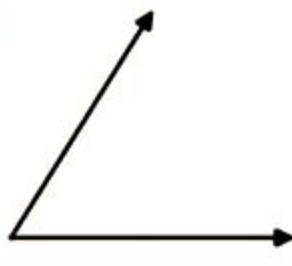
When measuring an angle, you may **extend the rays** of the angle if necessary to make measuring easier.

Try by yourself

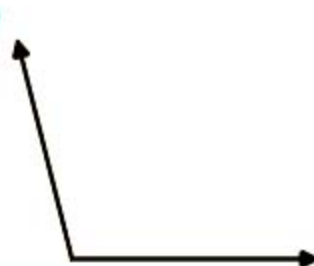


Use the protractor to measure the following angles:

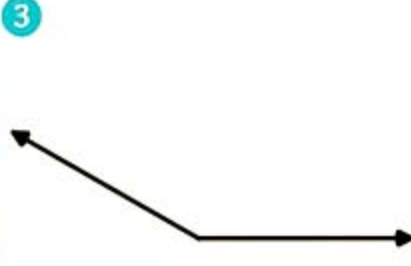
1



2



3



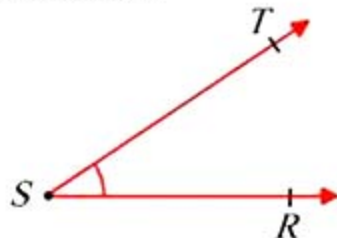
Exercises on Using a protractor and measuring angles



1 Choose the correct answer from the given options:

1 The point that represents the vertex of the opposite angle is.....

- (A) R (B) S
(C) T (D) $\overrightarrow{RS}$

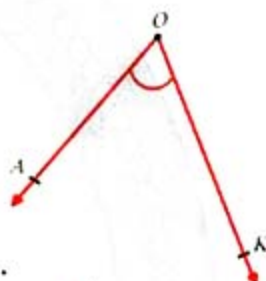


2 The angle formed by rays $\overrightarrow{AC}$ & $\overrightarrow{AB}$ is called.....

- (A) $\angle ABC$ (B) $\angle BCA$
(C) $\angle BAC$ (D) $\overrightarrow{AC}$

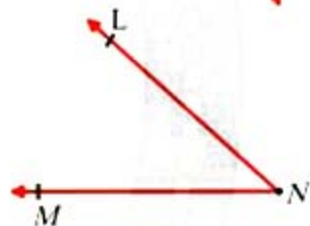
3 The name of the opposite angle is.....

- (A) $\angle AKO$ (B) $\angle AOK$
(C) $\overrightarrow{OK}$ (D) $\angle KAO$



4 The two rays that form the opposite angle are.....

- (A) $\overrightarrow{MN}$ & $\overrightarrow{LN}$ (B) $\overrightarrow{NM}$ & $\overrightarrow{NL}$
(C) $\overrightarrow{LN}$ & $\overrightarrow{LM}$ (D) $\overrightarrow{LN}$ & $\overrightarrow{MN}$



5 In angle ABC, the vertex point is.....

- (A) A (B) B
(C) C (D) $\overrightarrow{AC}$

6 The opposite angle is named.....

- (A) $\angle KNO$ (B) $\angle O$
(C) $\angle N$ (D) $\angle K$



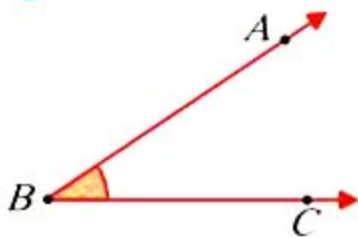
7 When using the outer scale of the protractor (angles between 90° and 180°) we can draw a(n).....

- (A) Acute angle (B) Right angle
(C) Obtuse angle (D) Straight angle



2 Write Three Different Names for Each of the Following Angles:

1

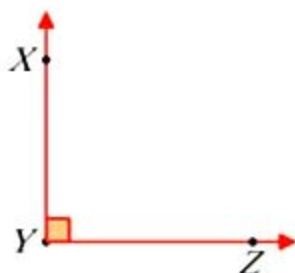


Name 1:

Name 2:

Name 3:

2

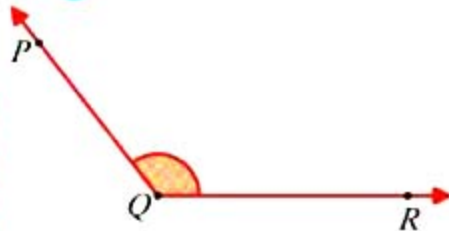


Name 1:

Name 2:

Name 3:

3

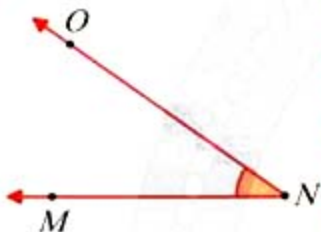


Name 1:

Name 2:

Name 3:

4

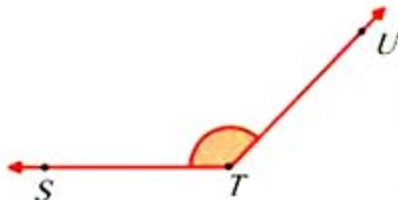


Name 1:

Name 2:

Name 3:

5

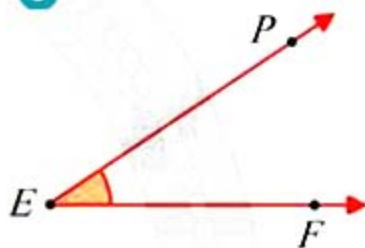


Name 1:

Name 2:

Name 3:

6



Name 1:

Name 2:

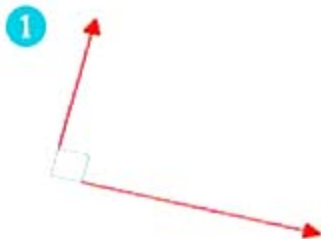
Name 3:

3 Complete the Following:

- 1 is used to measure and draw angles
- 2 The largest angle that can be measured with a protractor is a Measure
- 3 An angle is formed by two that intersection at a point called
- 4 An obtuse angle measures more than and less than

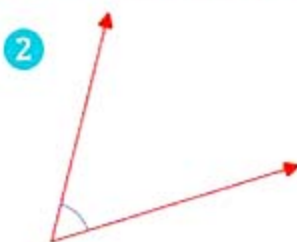
4 Use the Protractor to Measure the Following Angles:

1



.....

2



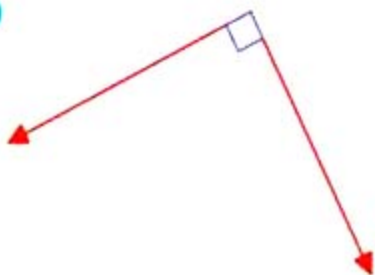
.....

3

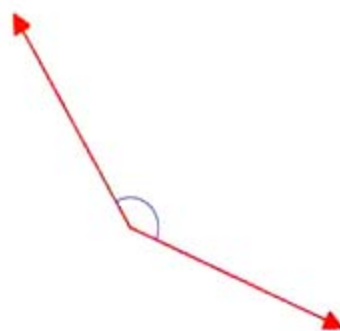


.....

4

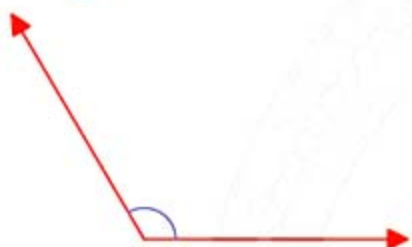


5



5 Classify Each Angle Below and Write Its Measure:

1



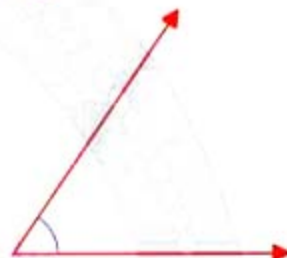
Type of Angle
Measure.....

2



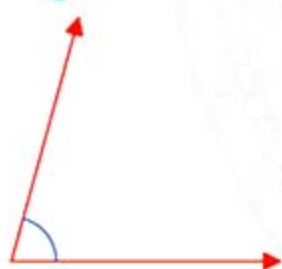
Type of Angle.....
Measure.....

3



Type of Angle.....
Measure.....

4



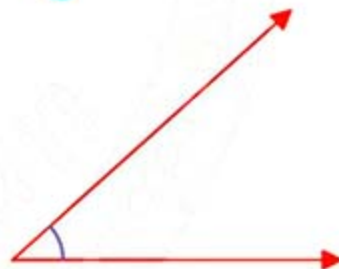
Type of Angle
Measure.....

5



Type of Angle.....
Measure.....

6



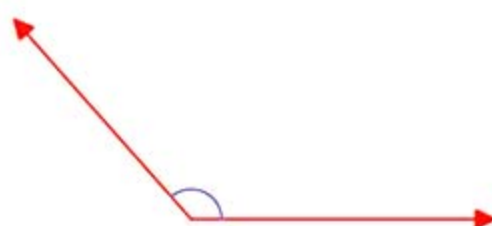
Type of Angle.....
Measure.....

7



Type of Angle.....
Measure.....

8



Type of Angle.....
Measure.....



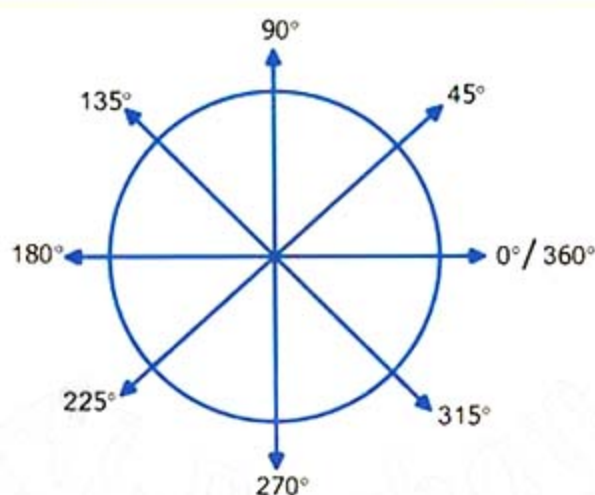
Drawing angles and Drawing angles using a protractor

Learn



Drawing angles

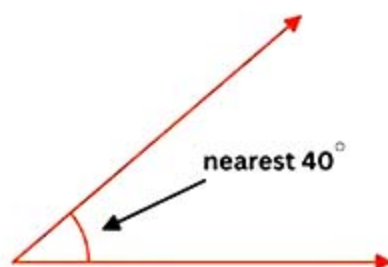
Reference Angles are special angles with known measures that help us estimate other angles



Estimating Angles by Comparison:

To draw an estimated angle (for example, 40°) without using a protractor

1. Compare the required angle to the nearest reference angle.
2. 40° lies between 0° and 45°
3. 40° is slightly smaller than 45° .
4. Draw the estimated angle accordingly.



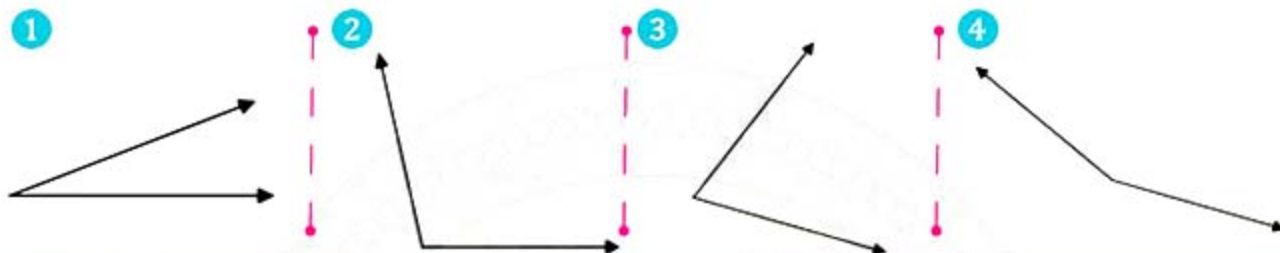
Example 1



Draw the following angles by estimation (without using the protractor).

1 20° 2 103° 3 75° 4 150°

Solution



Learn



2 Drawing Angles Using the Protractor:

To draw an angle of 100° , follow these steps

Step 1

- Place the ruler along a straight line. Mark the vertex point and draw one ray using the straight edge of the protractor.

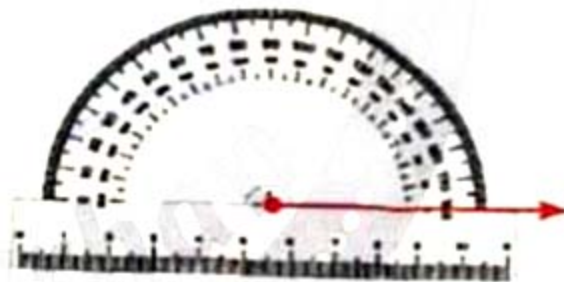
The vertex
of an angle

The first ray
of the angle



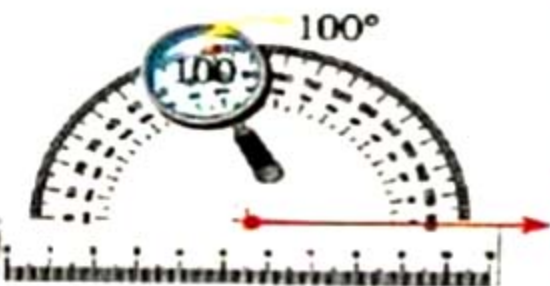
Step 2

- Place the center mark of the protractor on the vertex, aligning the zero line with the drawn ray



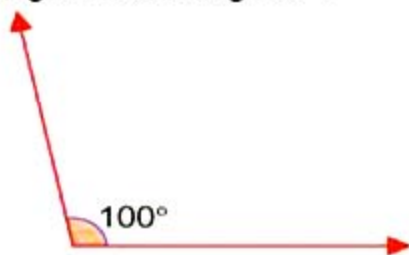
Step 3

- Mark a point at 100° on the inner scale of the protractor



Step 4

- Join the vertex and the marked point with a straight line. You now have an obtuse angle measuring 100° .





Example 2



Use the protractor to draw the following angles :

1 120°

2 94°

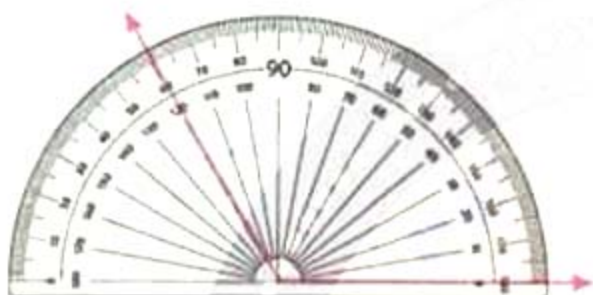
3 58°

4 180°

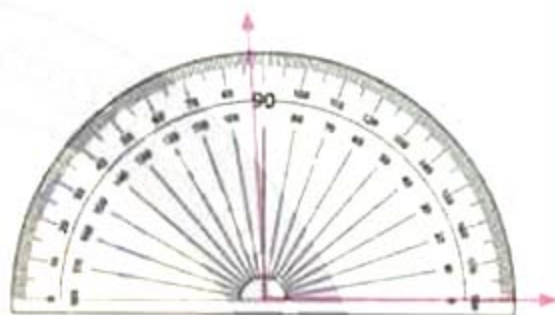
Solution



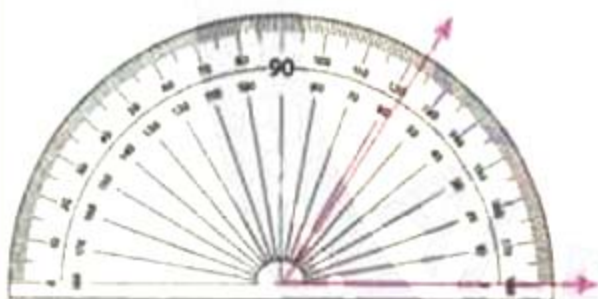
1



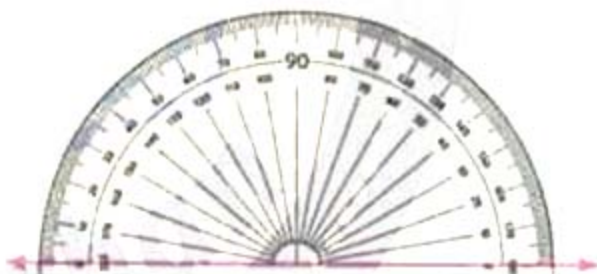
2



3



4



Exercises on Drawing angles and Drawing angles using a protractor



1 Circle the Angle that Matches Each of the Following Measures:

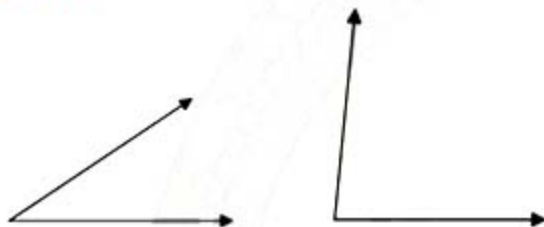
1 45°



2 60°



3 125°



4 85°



2 Draw Each of the Following Angles Using the Protractor and Write Its Type:

1 80°

2 95°

3 75°

4 180°

Type of angle

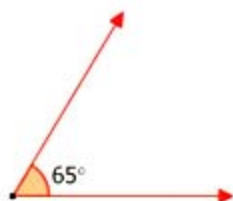
Type of angle

Type of angle

Type of angle

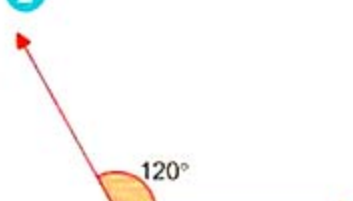
3 Write the Reference Angle Used to Estimate the Drawing of Each of the Following:

1



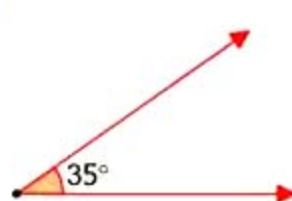
.....

2



.....

3



.....



4 Complete the Following:

- 1 The angle measuring 97° is.....
- 2 The angle measuring 25° is.....
- 3 The angle measuring 180° is.....
- 4 The reference angle used to estimate a 27° =.....
- 5 The reference angle used to estimate a 130° =.....



A Quick Guide to Drawing Angles

Learn two simple methods for drawing any angle you need, from a quick sketch to a perfect measurement.

METHOD 1: ESTIMATION (THE QUICK SKETCH)

Use Reference Angles



Use common angles like 0° , 45° , 90° , and 180° as mental guides.

Compare and Draw



To draw a 40° angle, visualize a 45° angle and draw one that is slightly smaller.

METHOD 2: USING A PROTRACTOR (PERFECT PRECISION)

1. Draw Your Base Ray



Draw a straight line from a starting point (the vertex).

2. Align the Tool



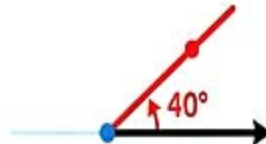
Place the protractor's center on the vertex and align the 0° line with your ray.

3. Mark the Measurement



Find the desired degree on the protractor's scale and make a small mark.

4. Connect the Points



Draw a straight line from the vertex to the mark to complete your angle.

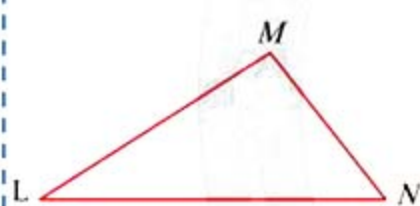
Classifying triangles using geometric tools

Learn



Classifying triangles using geometric tools

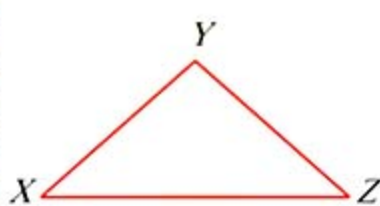
We can determine the types of triangles by measuring the lengths of their sides using a ruler:



- ❖ Length of $\overline{LN} = 4 \text{ cm}$
- ❖ Length of $\overline{MN} = 2 \text{ cm}$
- ❖ Length of $\overline{LM} = 3 \text{ cm}$

Therefore:

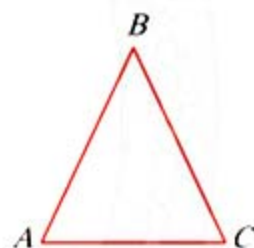
- ❖ LMN Scalene Triangle.



- ❖ Length of $\overline{XY} = 2 \text{ cm}$
- ❖ Length of $\overline{XZ} = 3 \text{ cm}$
- ❖ Length of $\overline{ZY} = 2 \text{ cm}$

Therefore:

- ❖ XYZ Isosceles Triangle.



- ❖ Length of $\overline{AB} = 2 \text{ cm}$
- ❖ Length of $\overline{AC} = 2 \text{ cm}$
- ❖ Length of $\overline{BC} = 2 \text{ cm}$

Therefore:

- ❖ ABC Equilateral Triangle.

Note that:



*Triangles are classified according to the lengths of their sides into three types:

1. **Equilateral Triangle:** All sides are equal in length.
2. **Isosceles Triangle:** It has two equal sides.
3. **Scalene Triangle:** All sides are different in length.

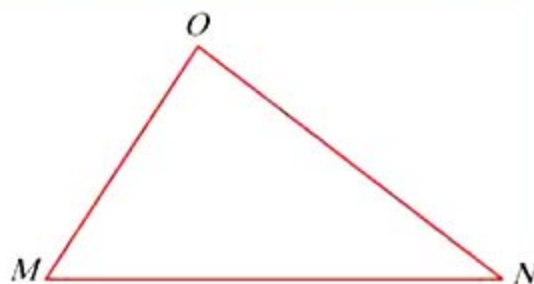


Example 1



Observe the following triangle and complete:

- 1 Length of $\overline{MN}$ =
- 2 Length of $\overline{NO}$ =
- 3 Length of $\overline{OM}$ =
- 4 The type of the triangle according to the sides:



Solution



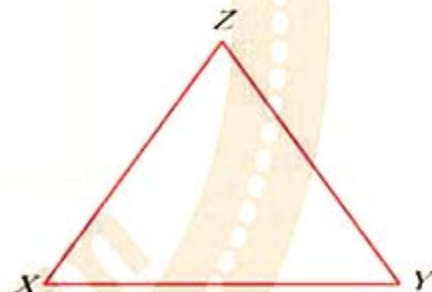
- 1 5 cm
- 2 4 cm
- 3 3 cm
- 4 Scalene triangle

Try by yourself

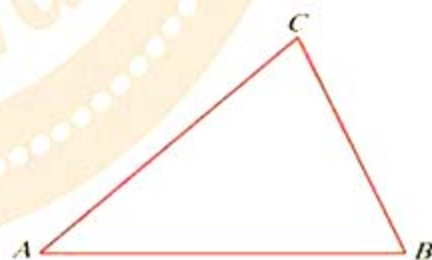


Look at the following triangles and use a ruler to measure the length of each side, then determine their types according to the lengths of their sides:

- 1
 - ❖ Length of $\overline{XY}$ =
 - ❖ Length of $\overline{XZ}$ =
 - ❖ Length of $\overline{ZY}$ =
 - ❖ Type of triangle.....



- 2
 - ❖ Length of $\overline{AB}$ =
 - ❖ Length of $\overline{AC}$ =
 - ❖ Length of $\overline{BC}$ =
 - ❖ Type of triangle



Learn



We can also classify triangles by measuring their angles using a protractor

Classifying Triangles by Their Angles:

Obtuse-angle

$90^\circ < \text{One angle}$

Right-angle

$90^\circ = \text{One angle}$

Acute-angle

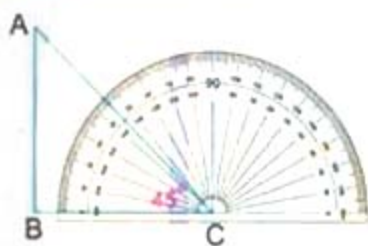
$90^\circ > \text{All angles}$

Steps for Measuring the Angles of a Triangle:

1. Place the center of the protractor at the **vertex** of one angle of the triangle.
2. Align the zero line of the protractor with one side of the angle.
3. Repeat these steps for the other two angles of the triangle.

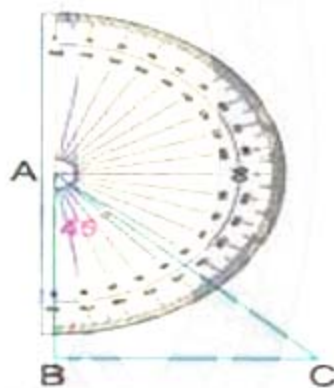
1) determining the $m(\angle C)$

$m\angle C = 45^\circ$



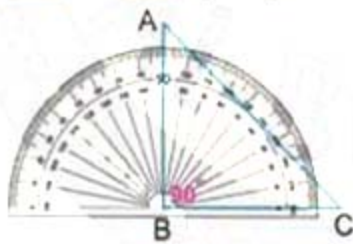
2) determining the $m(\angle A)$

$m\angle A = 45^\circ$



3) determining the $m(\angle B)$

$m\angle B = 90^\circ$



❖ If the triangle ABC has one angle $= (90^\circ)$ right ,

Therefore, $\triangle ABC$ is a **right-angled triangle**.

Note that:



In an **equilateral triangle**, all angles are **equal** and each measures 60° .

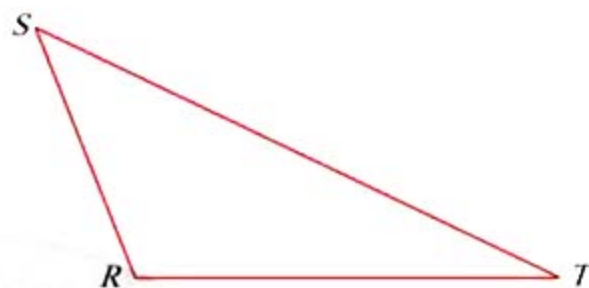


Example 1



Look at the triangle shown, then complete:

- 1 $m(\angle S) = \dots\dots\dots$
- 2 $m(\angle R) = \dots\dots\dots$
- 3 $m(\angle T) = \dots\dots\dots$
- 4 Type of triangle by its angles.....



Solution



- 1 40°
- 2 110°
- 3 30°
- 4 Obtuse-angled triangle

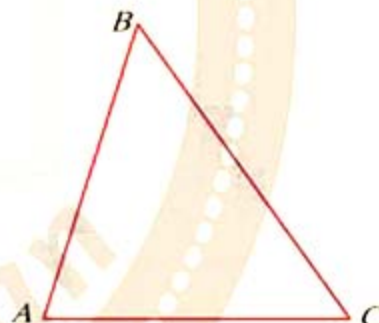
Try by yourself



Measure the angles, then determine the type of each triangle according to its angles:

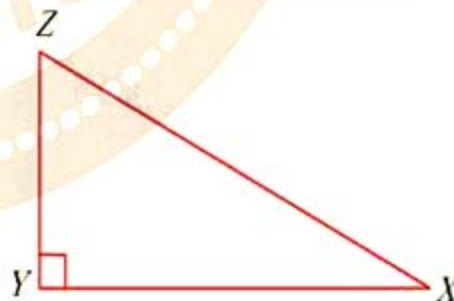
1

- $m(\angle A) \dots\dots\dots =$
- $m(\angle B) \dots\dots\dots =$
- $m(\angle C) \dots\dots\dots =$
- Type of triangle



2

- $m(\angle Z) \dots\dots\dots =$
- $m(\angle Y) \dots\dots\dots =$
- $m(\angle X) \dots\dots\dots =$
- Type of triangle



Exercises on Classifying triangles using geometric tools



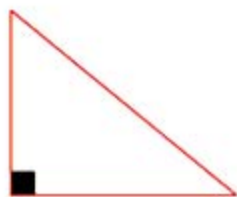
1 Choose the correct answer from the given options :

- 1 If the largest angle in a triangle measures 125° the triangle is.....
☐ A Acute-angled ☐ B Obtuse-angled ☐ C Right-angled ☐ D Equilateral
- 2 A triangle with side lengths 3 cm, 4 cm, and 5 cm is called a.....
☐ A Equilateral ☐ B Isosceles ☐ C Scalene ☐ D otherwise
- 3 If the largest angle in a triangle measures 80° , then it is a(n).....
☐ A Acute-angled ☐ B Obtuse-angled ☐ C Right-angled ☐ D Equilateral
- 4 The triangle whose side lengths are 5 cm, 6 cm, andcm is called an isosceles triangle.
☐ A 3 ☐ B 4 ☐ C 5 ☐ D 7
- 5 If the angles of a triangle are 40° , 50° , and 90° , the triangle is.....
☐ A Acute-angled ☐ B Obtuse-angled ☐ C Right-angled ☐ D Equilateral
- 6 A triangle with side lengths 8 cm, 8 cm, is called an Equilateral triangle .
☐ A 3 ☐ B 4 ☐ C 5 ☐ D 8
- 7 If one of the triangle's angles measures 90° , the triangle is a.....
☐ A Acute-angled ☐ B Obtuse-angled ☐ C Right-angled ☐ D otherwise
- 8 A triangle with side lengths 5 cm, 5 cm, and 5 cm is
☐ A Equilateral ☐ B Isosceles triangle ☐ C Scalene ☐ D Right-angled
- 9 Triangle ΔRST with side lengths 3 cm, 7 cm, and is Isosceles triangle
☐ A 7 ☐ B 5 ☐ C 10 ☐ D 4
- 10 A triangle with angles 60° , 40° , and 80° is an.....
☐ A Acute-angled ☐ B Obtuse-angled ☐ C Right-angled ☐ D Equilateral
- 11 A triangle with its largest angle measuring 100° is an
☐ A Acute-angled ☐ B Obtuse-angled ☐ C Right-angled ☐ D Equilateral



12 The triangle shown in the figure is a(n)

- ☐ A Acute-angled ☐ B Obtuse-angled
☐ C Right-angled ☐ D Equilateral



13 The triangle whose side lengths are 6 cm, 8 cm, and 10 cm is a/an triangle regarding its side lengths.

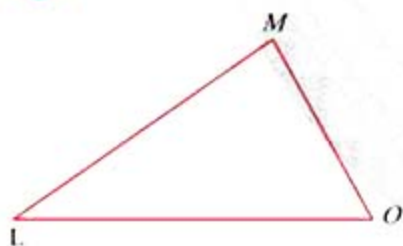
- ☐ A Equilateral ☐ B isosceles
☐ C Scalene ☐ D Obtuse-angled

2 Complete the Following:

- 1 A triangle with side lengths 4 cm, 4 cm, and 4 cm is.....
- 2 A triangle that contains a 90° angle is.....
- 3 A triangle with sides 5 cm, 5 cm, and 8 cm is.....

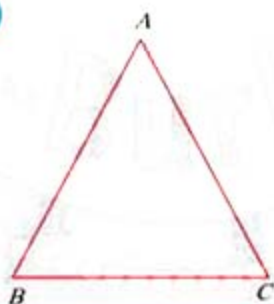
3 Use a ruler to measure the sides of each triangle and determine its type according to its sides:

1



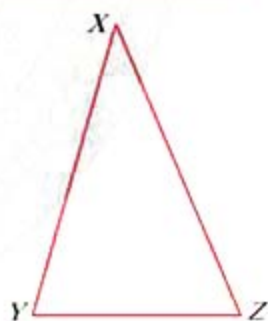
- ❖ Length of $\overline{XY} = \dots \text{cm}$
- ❖ Length of $\overline{YZ} = \dots \text{cm}$
- ❖ Length of $\overline{XZ} = \dots \text{cm}$
- ❖ Type $XYZ\Delta$

2



- ❖ Length of $\overline{AB} = \dots \text{cm}$
- ❖ Length of $\overline{BC} = \dots \text{cm}$
- ❖ Length of $\overline{AC} = \dots \text{cm}$
- ❖ Type $ABC\Delta$

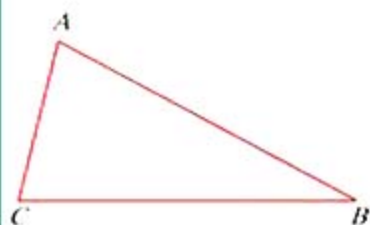
3



- ❖ Length of $\overline{LM} = \dots \text{cm}$
- ❖ Length of $\overline{LO} = \dots \text{cm}$
- ❖ Length of $\overline{MO} = \dots \text{cm}$
- ❖ Type $MLO\Delta$

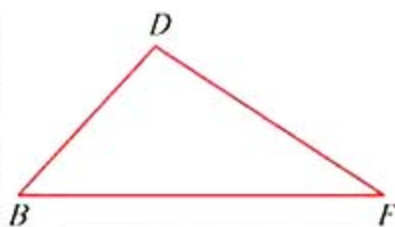
- 4 Use the protractor to measure the angles of each triangle, then determine its type according to the angles:

1



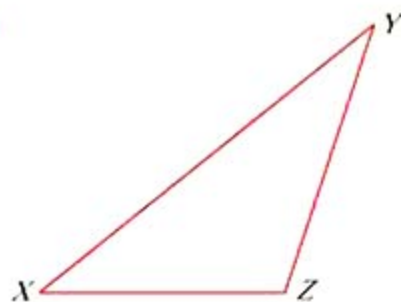
- ❖ $m(\angle X) = \dots\dots\dots$
- ❖ $m(\angle Z) = \dots\dots\dots$
- ❖ $m(\angle Y) = \dots\dots\dots$
- ❖ Type $\triangle XYZ \dots\dots\dots$

2



- ❖ $m(\angle D) = \dots\dots\dots$
- ❖ $m(\angle B) = \dots\dots\dots$
- ❖ $m(\angle F) = \dots\dots\dots$
- ❖ Type $\triangle DBF \dots\dots\dots$

3



- ❖ $m(\angle A) = \dots\dots\dots$
- ❖ $m(\angle C) = \dots\dots\dots$
- ❖ $m(\angle B) = \dots\dots\dots$
- ❖ Type $\triangle ABC \dots\dots\dots$



Triangle ID: A Quick Guide

Classification by Sides



Equilateral Triangle

All three sides are equal in length.



Isosceles Triangle

Has two sides of equal length.



Scalene Triangle

All three sides have different lengths.

Classification by Angles



Acute-angled Triangle

All three angles are acute (less than 90°).



Right-angled Triangle

Has one angle that is exactly 90° .



Obtuse-angled Triangle

Has one angle that is obtuse (greater than 90°).